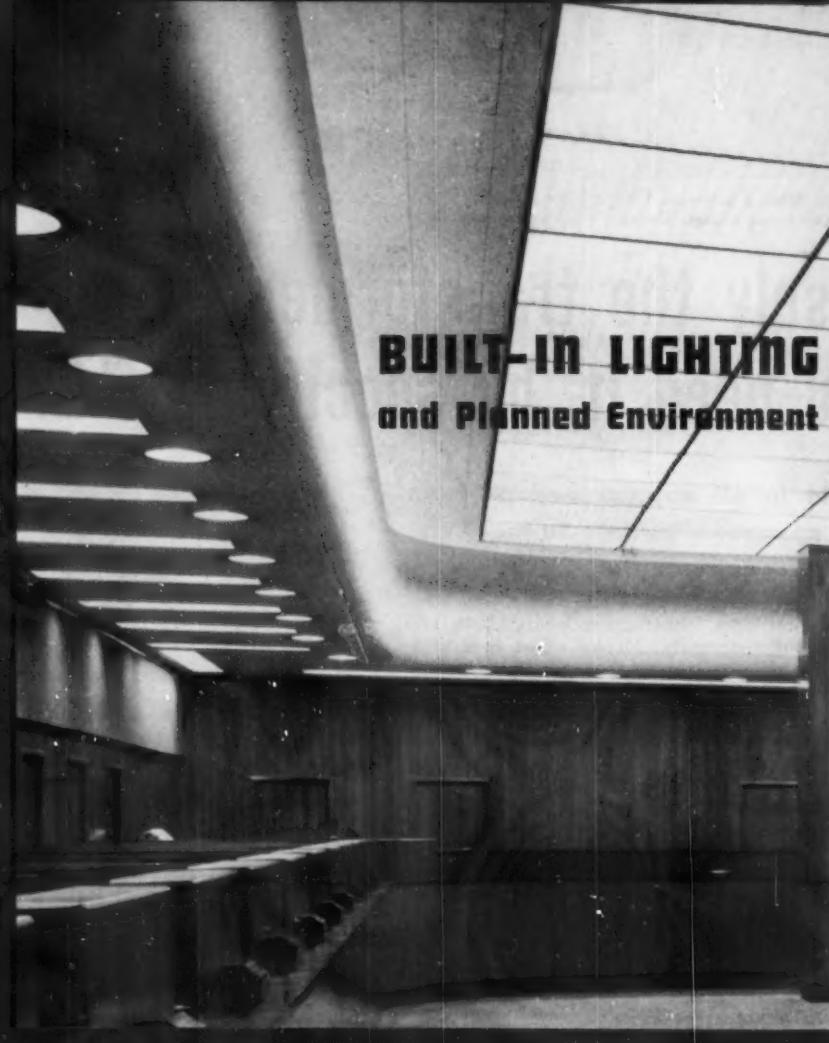


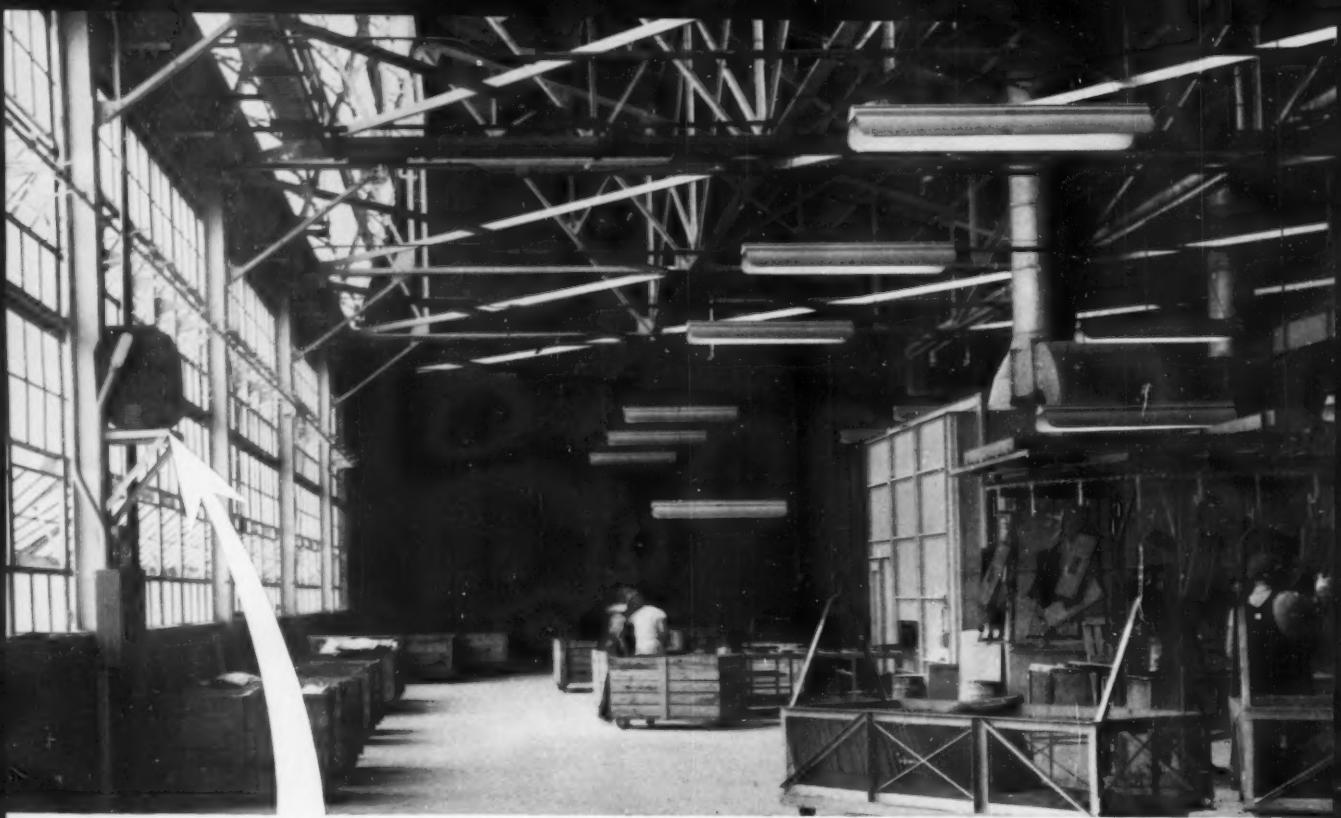
ELECTRICAL CONSTRUCTION AND MAINTENANCE

WEEKLY ELECTRICAL CONTRACTING



BUILT-IN LIGHTING
and Planned Environment

.... A Special Report
on new electrical
ceiling techniques



MOUNTED AT THE LOAD, G-E dry-types offer a low-cost way to provide the right voltage. Type D's, like those shown above,

are available in ratings 25 kva and up. Get immediate delivery from a national distribution system.

You get precisely the transformer you need ... when you need it, by specifying G.E.

G-E dry-types are available in all popular ratings from a national network of apparatus outlets to meet your immediate requirements.

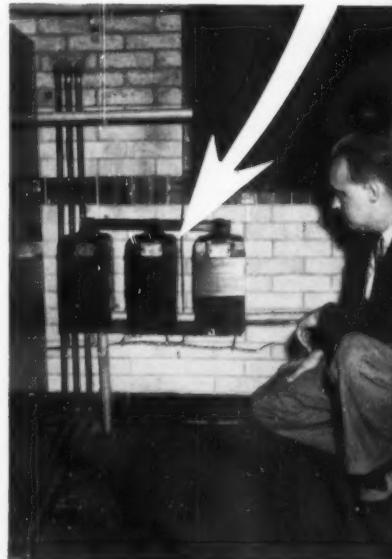
To solve lighting, power and space problems, contractors everywhere are insisting on General Electric dry-type transformers. Here's why: G-E dry-types are available immediately from warehouse stocks all across the country. Lightweight and small in size, G-E transformers save you on mounting hardware expenses. Simple in design, they are easy-to-handle . . . easy to install in out-of-the-way spots saving valuable floor space for production.

A low-cost answer to plans for revising plant layout or lighting systems, G-E dry-types eliminate the need for completely changing existing wiring. In addition, they give years of dependable service . . . you needn't worry about call-backs on G-E dry-types.

Indoors or out, there's a G-E dry-type to meet your customer's particular requirements whether he wants to step voltage up or down, boost or buck. Get full details from your nearby G-E Distributor or Apparatus Sales Office. Or write for Bulletin GED-2024 to General Electric Company, Section 411-123, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**



EASY TO INSTALL INDOORS OR OUTDOORS, G-E dry-types like this Type M require minimum space, are easily hung on a bracket. Available in ratings from .25 kva to 15 kva.

Electrical wire is no stronger than its insulation...

Q. What ONE wire and cable producer grows its own natural rubber, and makes its own synthetic rubber?

A. UNITED STATES RUBBER COMPANY

Q. What ONE wire and cable producer makes its own plastics?

A. "U. S."

Q. What is the most important part of wire and cable?

A. The insulation.

Q. Who is best equipped to make wire and cable with superior insulation?

A. U. S. RUBBER—which grows its own natural rubber, makes its own synthetic rubber, manufactures its own plastics.

ELECTRICAL INSULATION IS A "U. S." SPECIALTY!

Isn't it logical that a rubber company should make the best wire and cable insulation there is? U.S. Rubber has been a pioneer in insulation for close to 70 years—has amassed in that time a stockpile of research data and experience that can't be beat. Electrical insulation is a "U.S." specialty! Electrical insulation makes the difference between superior and ordinary wire and cable. Conductors of all manufacturers are standard, but insulation must be the best that science can produce. That's why your best bet in wire and cable is U.S. Rubber.



UNITED STATES RUBBER COMPANY
ELECTRICAL WIRE & CABLE DEPARTMENT • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Distinctive Packaging . . .

APPLETON

The Standard for Better Wiring

FOR USE WITH ELECTRICAL METALLIC TUBING

PA. No. 7514-616

CADMIUM FINISH

SIZE $1\frac{1}{2}$ "

APPLETON CONNECTORS

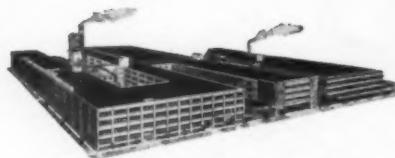
APPLETON ELECTRIC PRODUCTS

CONCRETE-TIGHT

CAT. NO. 92T050

APPLETON ELECTRIC COMPANY • CHICAGO

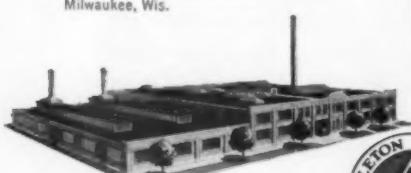
QUANTITY 500



General Offices and Plant No. 1, Chicago, Ill.



Foundry Division, Plant No. 2,
Milwaukee, Wis.



Lighting Division, Plant No. 3,
Chicago, Illinois



Explosion-Proof Fixtures

Maleable Iron Union Fittings

Industrial Lights

"ST" Series Liquid Tight Connectors

Extension Reelies

Outlet Boxes and Covers

■ Select wholesalers . . . APPLETON wholesalers . . . serve their customers from the distinctive APPLETON carton that typifies APPLETON's continuing program of research designed to build the finest in electrical fittings and supplies that money can buy.

The APPLETON carton is the visible symbol of APPLETON quality. Behind the carton are 3 great APPLETON plants with nearly 1,000,000 square feet of floor space where APPLETON engineering skill continues to mass-produce better products to sell at lower prices . . . one good reason why you should look for the famous APPLETON carton when you buy.

Sold Exclusively Through Selected Wholesalers

APPLETON ELECTRIC COMPANY
1704 Wellington Avenue • Chicago 13, Illinois

Also Manufacturers of:

ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting, The Electrogist and Electrical Record Established 1901

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

54th Year OCTOBER • 1954

Washington Report	61
At a Glance	63
Light's Diamond Jubilee, <i>An Editorial</i>	65
BUILT-IN LIGHTING AND PLANNED ENVIRONMENTS	
Analysis of today's lighting trends points up need for expanding new concept in lighting and environments.	67
Trans-Lighted Ceilings	68
Recessed Troffer Lighting	72
Recessed Incandescent Lighting	74
Luminous Environment	76
Acoustical Environment	78
Thermal Environment	80
New Design Ideas for Electric Ceilings	82
At the Test Bench-5	84
By WALTER J. PRISE—Positioning brushes on dc motors.	
Electrical Teamwork Clears Hurricane Damage	
When disaster staggered New England last month, scores of out-of-the-area electrical contractors rushed in men, materials and equipment to help local utility companies in their gigantic restoration effort.	86
Electrifying a Slaughter House	91
By LEE HARVILL—Extensive electrical distribution and circuiting vitalize operations at a modern and scientific, one-level meat preparation plant in Little Rock, Ark.	



ELECTRICAL CONSTRUCTION and MAINTENANCE

OCTOBER • 1954 *continued*

New Shop Techniques	94
How shop efficiency is kept high and promotes better customer service for Southern Electric Co., Inc., Charlotte, N. C.	
Selenium Power Rectifiers	96
By SAMUEL HELLER—Basic data on the construction and circuitry of typical equipments used in industrial applications.	
Motor Shops	103
Hinged bars form slot liners; attention to details gives shop plus values; fan rental a new shop service.	
Practical Methods	119
Full-load stand-by protects Hialeah Track; shop-made dolly serves as mobile reel rack; use camera to show installation problems.	
Reader Service	131
Product news announcements, catalogs and bulletins.	
Reader's Quiz	159
Questions and answers on capacitor start motor; static electricity on belt drives; vibrator type inverter.	
Questions on the Code	164
Answers to code questions including panelboard over-current protection; oil burner wiring; grounding systems and circuits.	
Modern Lighting	177
Coined cross louvers reduce fixture brightness; library modernizes with light; quality lighting fosters quality printing.	
In the News	183
Dates Ahead	205

Vol. 53, No. 10

ELECTRICAL CONSTRUCTION and MAINTENANCE

October 1954

Published monthly with an additional issue in September by McGraw-Hill Publishing Company Inc. James H. McGraw (1860-1948), Founder. Publication Office, 99-129 North Broadway Albany 1, N.Y.

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Donald C. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Executive Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to Electrical Construction and Maintenance—

Subscription Service, 99-129 N. Bway., Albany 1, N.Y. or 330 W. 42nd St., New York 36, N.Y. Allow one month for change of address.

Subscriptions are solicited only from persons engaged in electrical construction or electrical maintenance. Position and company connection must be indicated on subscription orders.

Single copies 35c. Electrical Products Guide \$2.50 to those in the electrical construction and maintenance industry. Subscription rates—United States and possessions, \$3.00 a year; \$4.00 for two years. Canada, \$5.00 a year; \$8.00 for two years. Other Western Hemisphere and Philippines, \$10.00 for one year; \$16.00 for two years. All other countries, \$15.00 a year. Entered as second class matter August 29, 1938 at the Post Office at Albany, N.Y., under act of Mar. 3, 1879. Printed in U.S.A. Copyright 1954 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved.

W. T. STUART, Editor

Alice McMullen, Associate Editor

Berlon C. Cooper, Eastern Editor

August Eckel, Middle West Editor

Hugh P. Scott, Industrial Editor

J. F. McPartland, Jr., Assistant Editor

W. J. Novak, Assistant Editor

John P. Reynolds, Assistant Editor

Harry Phillips, Art Editor

Ray Ashley, B. A. McDonald, Walter J. Prise, Glenn Rowell, B. Z. Segall, Consulting Editors

Dexter Keezer, Dir. Economic Staff

George B. Bryant, Jr., Chief Correspondent, Washington Bureau

Joseph K. Van Denburg, Jr., Editor, World News

W. W. GAREY, Publisher

C. B. Shaw, Advertising Sales Manager

District Managers

A. B. Conklin, New York

S. A. Jones, New York

L. S. Kelly, Jr., Philadelphia

F. J. Seller, Cleveland

R. A. Hubley, Detroit

Charles F. Minor, Jr., Chicago

R. R. Ream, Chicago

T. H. Carmody, San Francisco

C. W. Dysinger, Los Angeles

J. H. Cash, Dallas

W. D. Lanier, Atlanta

**Member of
AUDIT BUREAU OF CIRCULATIONS and
ASSOCIATED BUSINESS PUBLICATIONS**

...solid foundation

**FOR TODAY'S
COMPACT
MOTOR DESIGN**

There are, as you know, new NEMA Standards for electric motors... more power in less space.

When you look for a new NEMA frame motor, look for the one that is built on a solid foundation... it carries the Fairbanks-Morse Seal of Quality.

The Standards are new... But the Idea Is Not

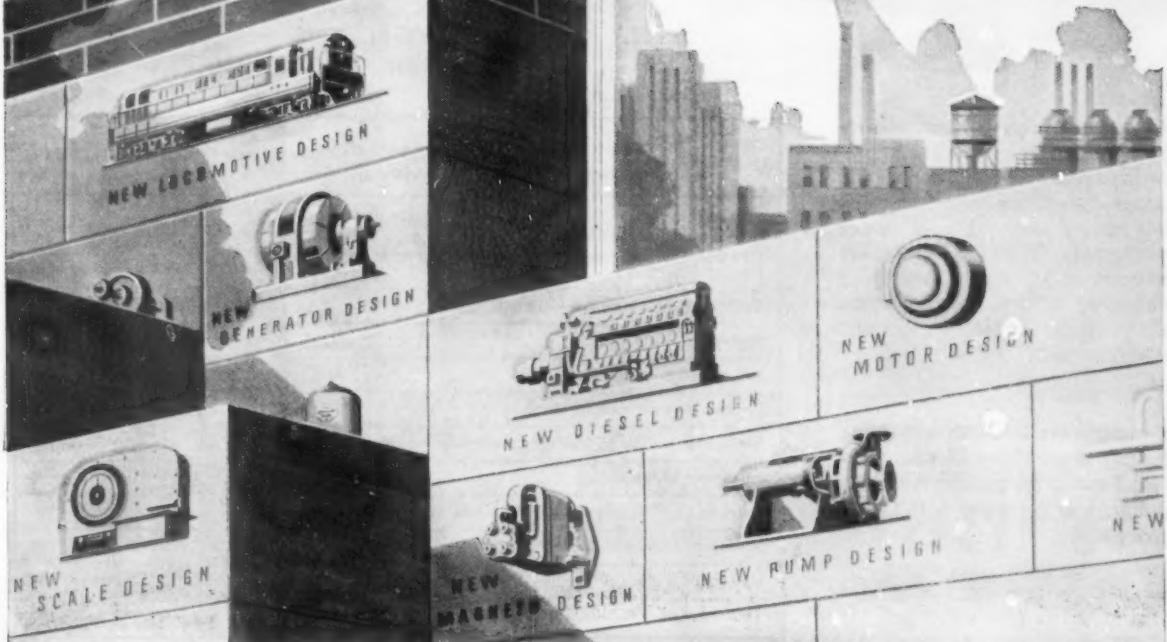
Like the recent Fairbanks-Morse developments in other lines, the new F-M motor is the result of a basic engineering philosophy: More Performance in Less Space—a 120-year tradition at Fairbanks-Morse. Fairbanks, Morse & Co., 600 South Michigan Avenue, Chicago 5, Illinois



FAIRBANKS-MORSE

a name worth remembering when you want the best

ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES
AND ENGINES • PUMPS • SCALES • RAIL CARS • HOME
WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS



NEW G-E MOTOR

Saves up to



Expands with your plant requirements . . . Select only those standardized sections, control units and accessories which meet your present needs. Then, as your power consumption grows, you can easily expand to keep pace with your changing control requirements. Only minimum or "on-the-job" wiring is necessary.

Compare the DA7093 with other leading competitive Control Centers. Feature for feature, dollar for dollar, you get more with G.E.'s space-saver.

HERE'S a new product that spells savings all along the line . . . from initial purchase to on-the-job operation. G.E.'s all-new Motor Control Center (Type DA7093) puts your motor control capacity in approximately *half* the space formerly required. It takes nine NEMA size one or six NEMA size two control units in one standard 90-inch trough. This means fewer sections to buy, fewer sections to find space for and fewer sections to maintain — a clean-cut case of dollar-and-cents economy.

More than a space-saver, this new Control Center incorporates engineering advances which drastically cut installation time, step up capacity, simplify operation and slash maintenance costs.

Equally important, it embodies new safety features . . . *extra* features that provide *extra* safety to the contractor or plant engineer.

Look at these major engineering advances . . . which bring you unprecedented savings, dependability and safety:

Center Busing doubles vertical bus capacity (from 300 to 600 amperes) . . . leaves top and bottom pull boxes free for wiring within and between sections . . . allows continuous main bus of 600 or 1200 ampere capacity up through five sections.

MOTOR CONTROL CENTER FEATURES	General Electric DA7093	Mfg. A	Mfg. B	Mfg. C
Can accommodate 9 size 1 starter units with disconnect and transformer	Yes	No	No	No
Center Busing	Yes	No	No	No
Split Type "B" Terminal Blocks	Yes	No	No	No
Individual Stab Blocks	Yes	No	No	No
Individual bus insulators	Yes	No	No	No
Positive unit grounding	Yes	No	No	No
Straight-in wiring to main lugs accessible from front	Yes	No	No	No
No across hinge wiring	Yes	Yes	No	No
Edge to Edge Configuration Main bus	Yes	No	No	No
Minimum 4 1/4 x 6 inch wiring gutter	Yes	No	No	No
Unit Pull handle	Yes	Yes	No	No
Vertical Bus, minimum 5 inch spacing	Yes	No	No	No

CONTROL CENTER

50% in Floor Space

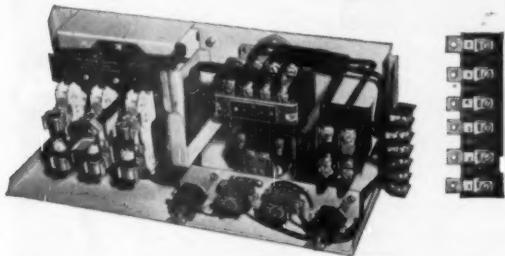
Split Type "B" Terminal Blocks allow you to add, switch or extract control units *without disturbing established wiring*.

Individual stab mountings cut your maintenance costs by as much as one-third because they can be replaced individually.

Positive grounding of each control unit before units engage bus bars. This, plus locking devices for both the control unit and operating handle, gives *added protection*.

Add a whole host of other design developments and you'll agree the DA7093 is designed for the future — *your future*.

For further details, please contact your nearest General Electric Apparatus Sales or Assemblies & Components Sales representative. Or write for Bulletin GEA-6160 — General Electric Co., Distribution Assemblies Department, Plainville, Connecticut.



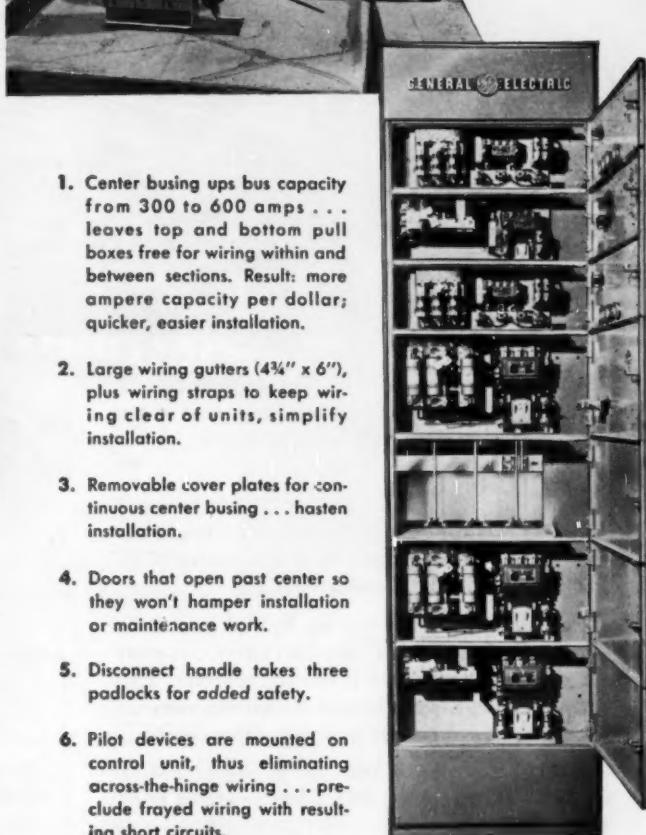
Control unit showing neat arrangement for easy maintenance. Type "B" Terminal Blocks (shown right) permit unit to be removed without disturbing wiring. Notice the fusible disconnect that can accommodate either or both Type NEC or Type CLF current limiting fuses.



Rear view of Control unit showing three individual bus stabs of silver-plated pure copper. Re-inforced with heat-treated spring steel, they assure positive contact with vertical bus.



Let a G-E motor control specialist show you how to conserve your motor control floor space. Let him help you select equipment for your specific requirements.



1. Center busing ups bus capacity from 300 to 600 amps . . . leaves top and bottom pull boxes free for wiring within and between sections. Result: more ampere capacity per dollar; quicker, easier installation.
2. Large wiring gutters (4 3/4" x 6"), plus wiring straps to keep wiring clear of units, simplify installation.
3. Removable cover plates for continuous center busing . . . hasten installation.
4. Doors that open past center so they won't hamper installation or maintenance work.
5. Disconnect handle takes three padlocks for added safety.
6. Pilot devices are mounted on control unit, thus eliminating across-the-hinge wiring . . . preclude frayed wiring with resulting short circuits.

Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

Reduce brightness contrasts . . .
get efficient, over-all lighting with SYLVANIA'S
ALL-WHITE SLOTTED REFLECTORS!

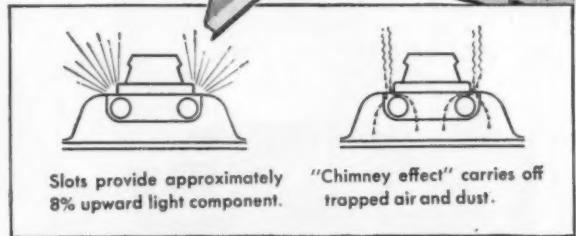


Now Sylvania introduces the Slotted Reflector . . . an improved industrial lighting design that results in far more efficient lighting *plus* lower maintenance costs!

The warehouse photo, above, shows how Sylvania's new Slotted Reflectors reduce brightness contrast by throwing an upward component of approximately 8% on the white ceiling.

And, because these slots are located just above the lamps, they create a "chimney effect" . . . carry off air normally trapped inside the reflector. This action also tends to remove dust and dirt accumulations . . . helps maintain high lighting levels.

These units are now available in all-white Miracoat or baked enamel, with open or closed ends. For full dimensional data and all details write to Dept. 4X-2410, Sylvania now!



In Canada: Sylvania Electric (Canada) Ltd.
University Tower Building, St. Catherine Street, Montreal, P. Q.

SYLVANIA

Sylvania Electric Products Inc. 1740 Broadway, New York 19, N. Y.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

Fast Service

for Dry-Type Transformers

A phone call delivers Allis-Chalmers quality transformers! Stocks of the most popular sizes and ratings of A-C dry-type transformers are located near you. And your local A-C representative is prepared to give you immediate action.

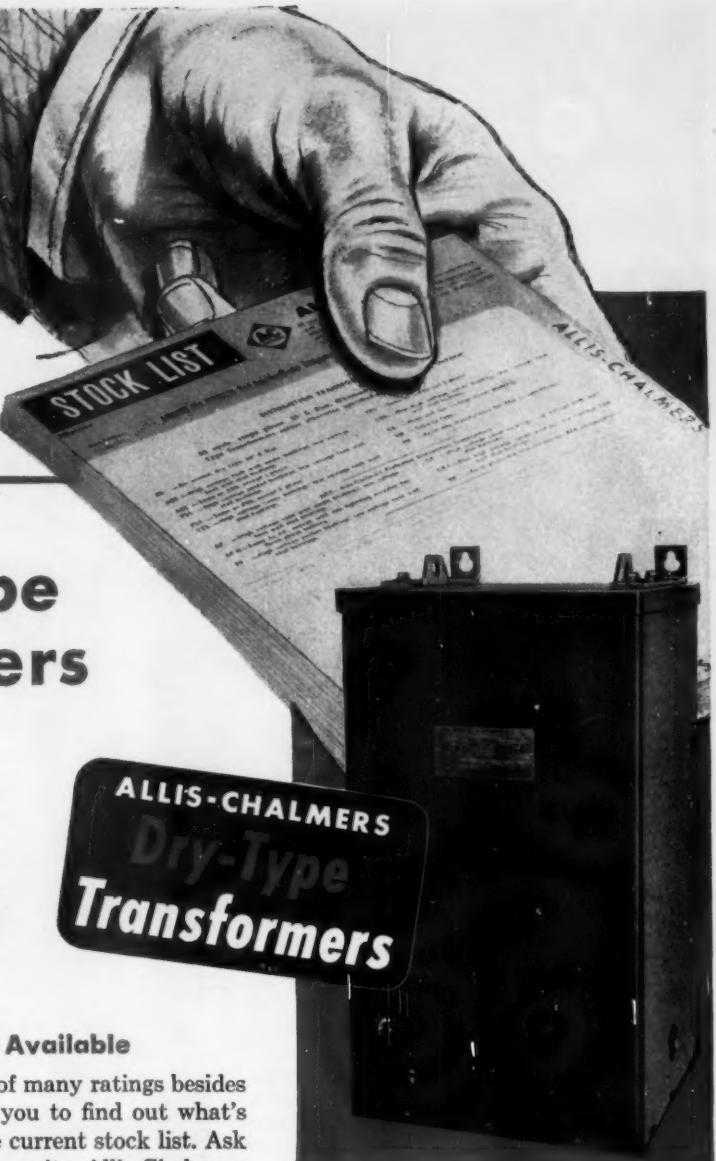
Current Stock List Available

Stocks usually include dry-types of many ratings besides those most popular. It will pay you to find out what's available by getting a copy of the current stock list. Ask your own A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Completely enclosed design. Ratings are single-phase sizes 10 kva and smaller; three-phase sizes 15 kva and smaller, 600 volts and below. Standard construction for small low voltage transformers. Recommended for indoor or outdoor applications—operate well in dusty or lint-filled atmospheres. Solderless connectors speed installation. Mount them on wall or post — no vault needed.

Openly ventilated transformers. Ratings are single-phase 15 kva and larger; three-phase 30 kva and larger, 15 kv and below. Designed for indoor use. Easy to hook up — most sizes have solderless connectors. Cooling air flows in through base openings through windings to maintain low temperature rise. Coils are impregnated to protect against dirt and moisture.

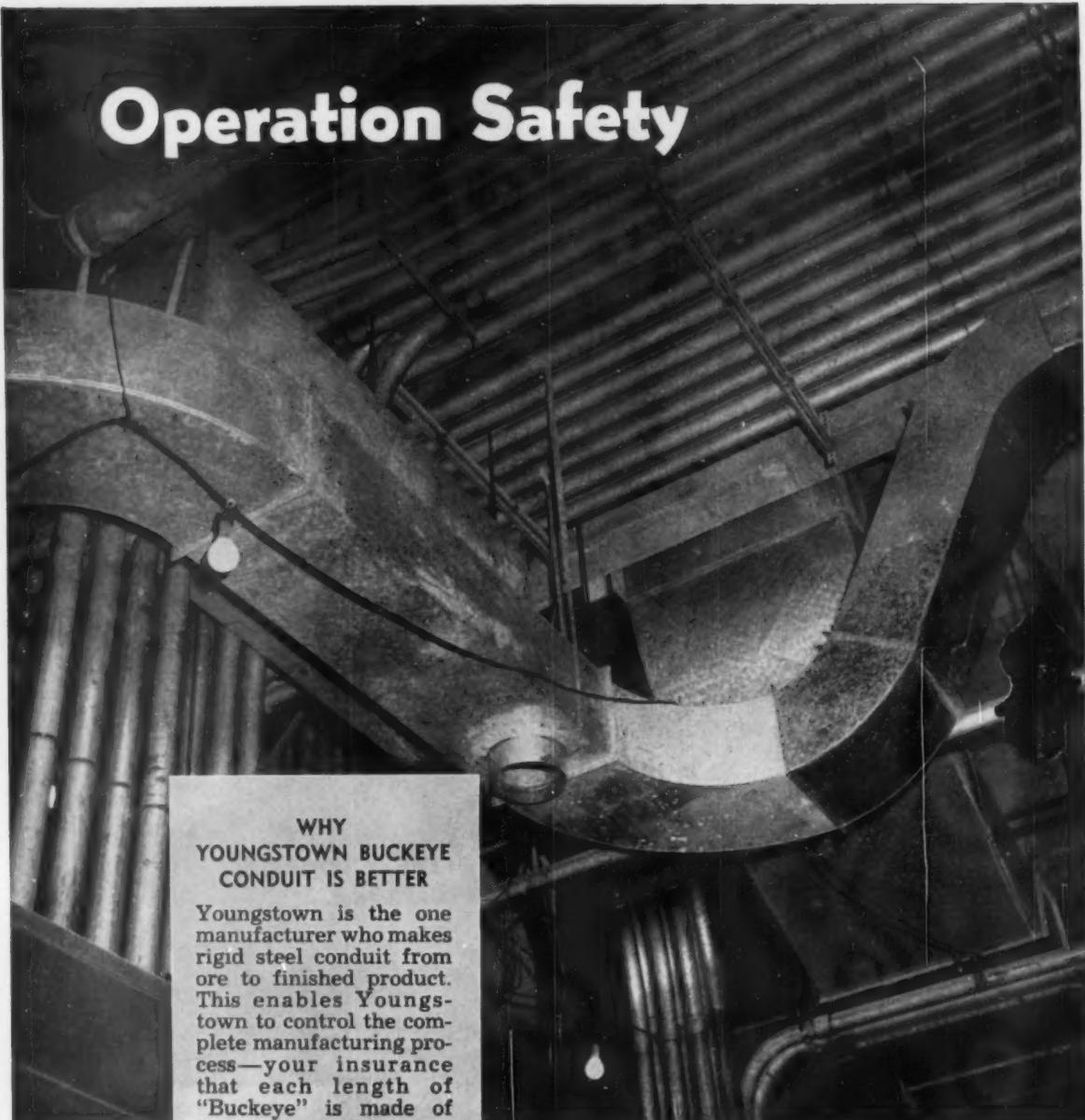
A-4386



ALLIS-CHALMERS



Operation Safety



WHY YOUNGSTOWN BUCKEYE CONDUIT IS BETTER

Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.

Youngstown



THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of
Carbon, Alloy and Viley Steel

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT
AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE -
HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

• Youngstown Buckeye Rigid Steel Conduit is the safe raceway. It is approved by the National Electrical Code for all hazardous locations. In addition it is safe and sure to work with—easy to bend, and erect. Enamel does not chip. Thus Buckeye provides a smooth, continuous raceway for fast, trouble-free running or withdrawal of wires.



NEW! A FEATURE-PACKED LINE OF TYPE D SAFETY SWITCHES

FOR REAL ECONOMY and special advantages to you and the user, there is nothing like this new Federal Noark® line of Type D (Nema Type G) Safety Switches. The line includes 30, 60, 100, 200, 400, and 600 amp. sizes and each is available in both general purpose and raintight enclosures.

The styling of these new Type D's is smart and modern...the general design is uniform throughout, assuring identical high standards of quality and performance plus attractive appearance of completed installations. In addition, each of these switches embodies those features that have proved most desirable and practical during years of service in the field.

EASE OF INSTALLATION is provided by generous wiring gutters...solderless connectors...neutrals

located for direct feed-through wiring...plenty of right-size knockouts.

NEW STANDARDS OF RELIABILITY are assured by big, husky, current-carrying parts...simple knife blade construction...new patented pressure-type fuse holder.

MAINTENANCE IS SIMPLE because all moving parts are readily visible...unit block construction on 60, 100 and 200 amp. switches simplifies maintenance...30 amp. switch blocks molded of new high-shock phenolic material...operating bar under the block of 30 amp. switch permits unobstructed access to fuses.

Order the new Federal Noark Type D Safety Switches from your distributor for new savings and efficiency. And write us for full information.



FEDERAL PACIFIC ELECTRIC CO.

FORMERLY—FEDERAL ELECTRIC PRODUCTS COMPANY AND PACIFIC ELECTRIC MANUFACTURING CORP.

Main Office: 50 PARIS STREET, NEWARK 1, N. J.

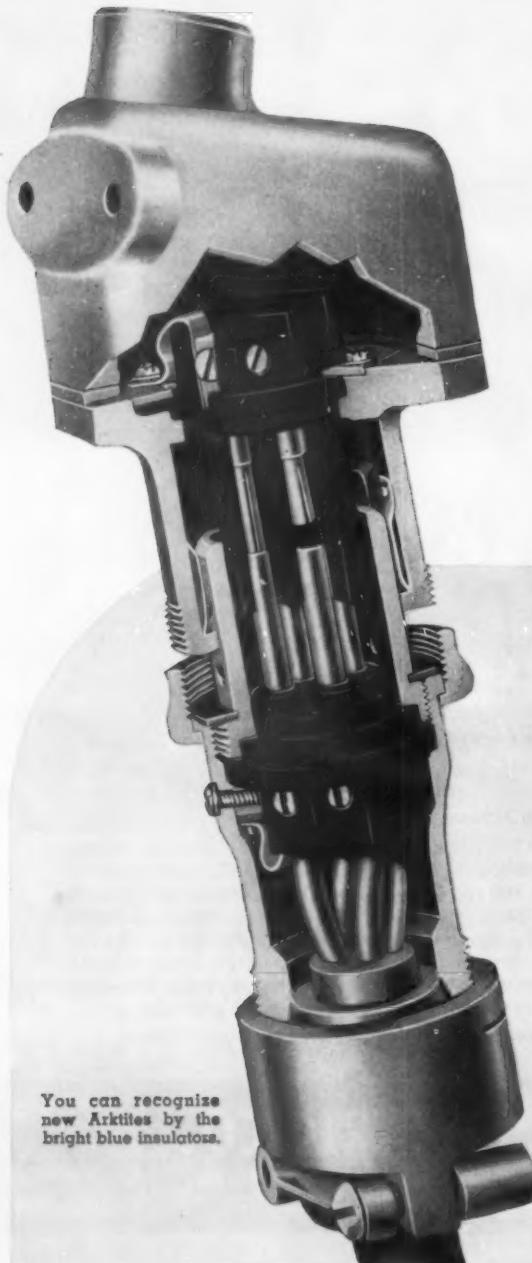


Federal Pacific products: Stab-Lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct, High voltage circuit breakers and power switches ★ Sales offices in principal cities.

Announcing...

New, Re-Designed

Arktite **HEAVY DUTY**
PLUGS & RECEPTACLES



New pressure connectors; no soldering unless you prefer to do it.

New easier-to-wire interior assembly; comes out in one piece—just remove 2 screws.

New easier-to-reverse plugs and receptacles; no machining; no special tools.

New plug adaptability: takes any size portable cable up to full 30 amp. capacity.

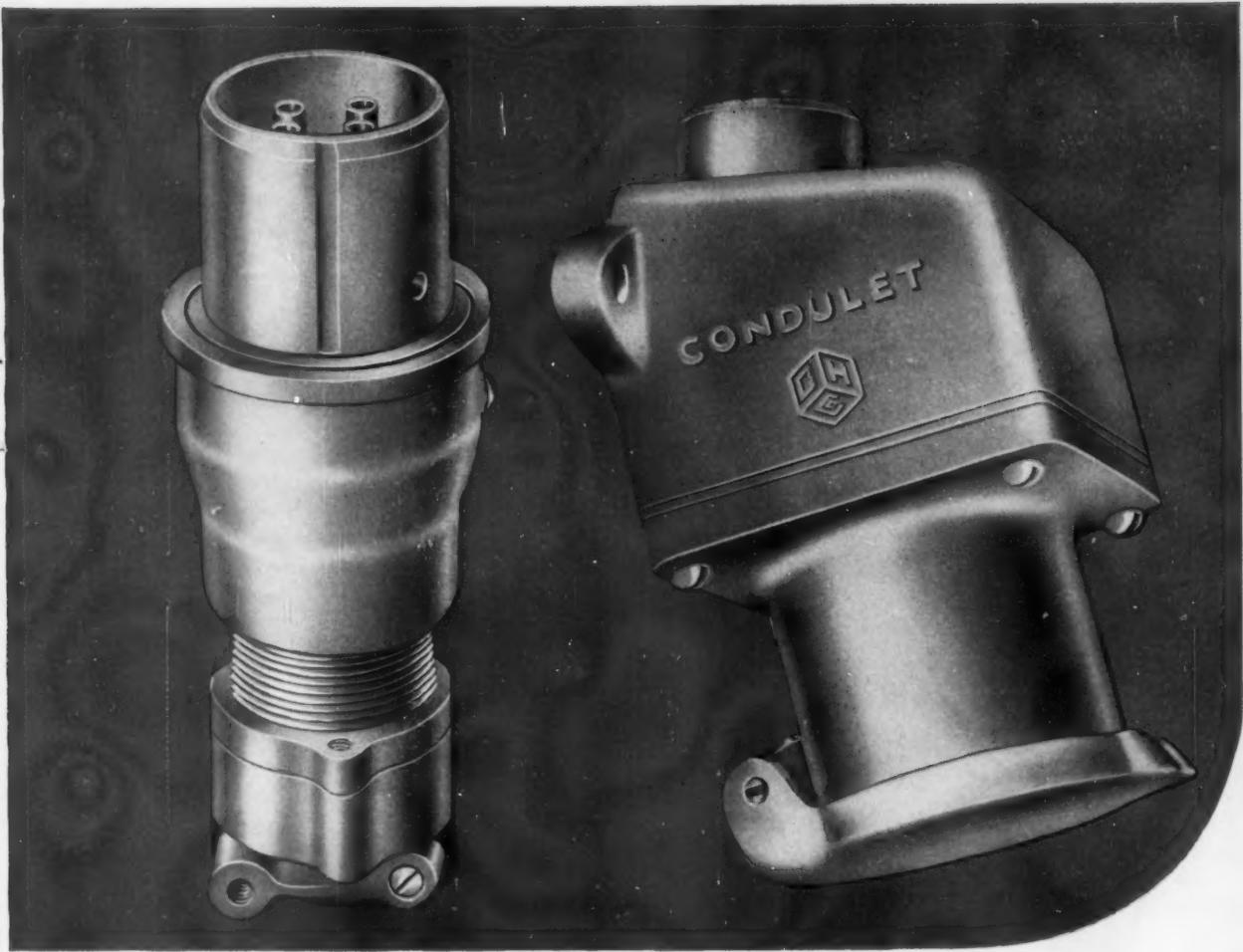
Circuit-Breaking Features make Arktite safe at full load without disconnect switches

Arktite's principle of insulating each contact in a separate chamber has been recognized for 20 years as the *safe* way to snuff the arc in making or breaking a circuit. Momentary arcs are formed or broken while the plug contact is still inside the arcing chamber. Flash-over to the other side of the circuit or to the housing cannot occur even if the break is made at full load.

Grounding contact made first; broken last: Arktite's grounding contacts are longer than the load contacts. Plug and tool are grounded *before* the circuit is made and *after* it is broken.

Arc snuffed by pressure and lack of oxygen: Each plug fits so closely in the opening of its individual arcing chamber that arcs are snuffed by pressure-deionization and lack of oxygen.

Cable Entrance Watertight: A clamping nut seals a rubber bushing tightly around the cable. No moisture can enter.



First Complete Re-Design in 20 Years...

yet fully interchangeable with older types

Arktite's basic design is so safe and practical that no change in the fundamentals has been found necessary in 20 years. New wiring ease . . . new flexibility in making either the plug or receptacle the power side . . . and new adaptability to varying portable cable sizes up to 30 amps. have dictated today's re-design.

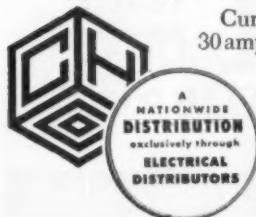
Even so, the improved Arktite plugs and receptacles are fully interchangeable with older types, and *list at the same economical price*.

Currently available in only the 30 amp. size (to be followed soon by new 60 and 100 amp. sizes), today's improved Arktites are

made with two distinct ground circuits. Style 2 (illustrated) has an extra grounding contact bonded to the housing and forming a parallel circuit with the plug sleeve and receptacle detent spring. This assures continuity of the grounding circuit under severe service. Style 1 relies upon contact of the plug sleeve with the detent to complete the safety circuit. The extra grounding conductor in the portable cable is bonded to the plug handle.

Two-pole, three-pole and four-pole styles.

Full details described in technical bulletin sent free on request. Or see your Crouse-Hinds distributors.



C R O U S E - H I N D S C O M P A N Y

SYRACUSE 1, N.Y.

CONDULETS • FLOODLIGHTS • TRAFFIC SIGNALS • AIRPORT LIGHTING

B-M *Fittings*

ARE APPROVED AS
CONCRETE TIGHT



When setting E. M. T. in concrete you can make each job easier and more profitable by using Briegel All Steel Indenter Fittings that have UL approval as CONCRETE-TIGHT. Contractors the world over recognize their cost cutting qualities and the fact that they make each wiring job a better job. It is only natural that Briegel Fittings are the most widely used E. M. T. connectors and couplings.



Cross Section
Showing
Indentations.

All B-M Indenter Fittings are U. L. approved as Concrete-tight and for General Use. (File Card E 10863). Also comply with Federal Specifications W-F-406.



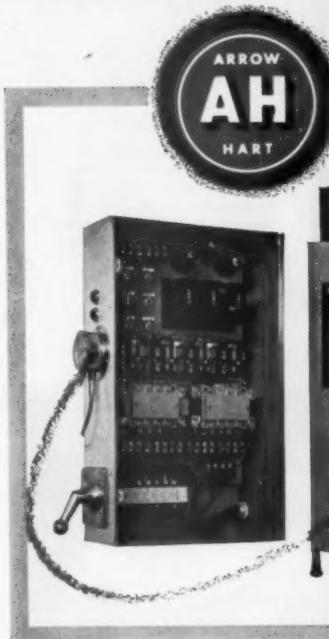
BRIEGEL
METHOD
TOOL
CO.
GALVA, • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!

SPECIFY

ARROW-HART SPECIAL CONTROLS

FOR EXTRA-SPECIAL PERFORMANCE



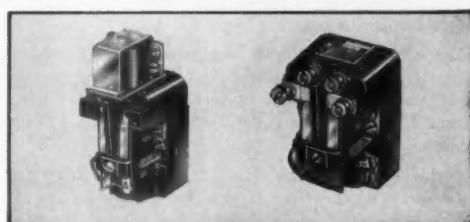
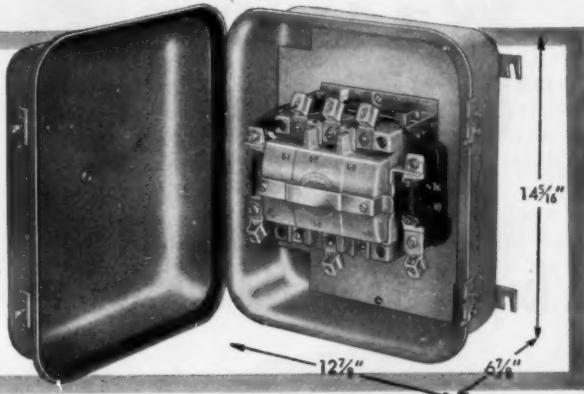
A-H NEMA TYPE XII (Industrial-Use) ENCLOSURES

Recommendations of leading Industrial Engineers throughout the country have helped us make these the finest enclosures ever offered for use where dust, lint, fibres, oil seepage and similar materials must be excluded. Teamed with A-H Starters, they assure superior electrical performance. Features include: efficient BALLOON TYPE NEOPRENE GASKET; RUGGED CONSTRUCTION of heavy, seamless steel; NO KNOCKOUTS with no chance of accidental removal admitting breakdown material; QUICK-REMOVABLE MOUNTING PLATE, and POSITIVE LATCHING MECHANISM.

ALL CONTROLS in your electrically operated machines and equipment must provide full performance and dependability. You can't neglect any link in the vital control chain... so specify Arrow-Hart Special Controls. Like all the "ADVANCED DESIGN" Controls in the complete Arrow-Hart line, they are engineered and manufactured to assure maximum productive efficiency.

A-H PANEL COMPONENTS

Modern, automatic equipment demands complex electrical controls. Smaller, lighter A-H Components reduce panel size, save vital space, and help provide greater productive capacity. This Alvey-Ferguson Pot and Pan Washer, for example, features small size, big capacity and electronic timing of the wash-drain-rinse cycle. All of the A-H Controls... 2 Starters, 4 Magnetic Relays, 4 Potted Electronic Components and 1 "PPS" Switch... are housed in a single, unusually compact panel.



A-H MIDGET MAGNETIC RELAYS

Specifically designed for mounting in limited space, A-H Midget Magnetic Relays offer low wattage consumption and high power factor. They provide efficient control for fractional horsepower motors and a wide variety of other light loads. Two types are available: TYPE "MR" (High Cycling) and TYPE "LR" (Latched-type, used where operating sequence must be maintained regardless of voltage failure). Various normal contact positions are available for almost any need.



ARROW-HART INDUSTRIAL CONTROL DIVISION

103 HAWTHORN ST., HARTFORD 6, CONN., U.S.A.

Offices, sales engineers and warehouses in: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco. In Canada: Arrow-Hart & Hegeman (Canada) Ltd., Mt. Dennis, Toronto, In England: Arrow Electric Switches, Ltd., Ealing, London WS.

Quality MOTOR CONTROLS • WIRING DEVICES
ENCLOSED SWITCHES • APPLIANCE SWITCHES

INDUSTRIAL CONTROL DIVISION

THE ARROW-HART & HEGERMAN ELECTRIC CO.
103 HAWTHORN STREET, HARTFORD 6, CONN.

Please send literature giving full details on A-H Control Panel Components, Type XII Enclosures and Magnetic Relays.

Please send the new A-H Industrial Motor Control Catalog.

NAME _____

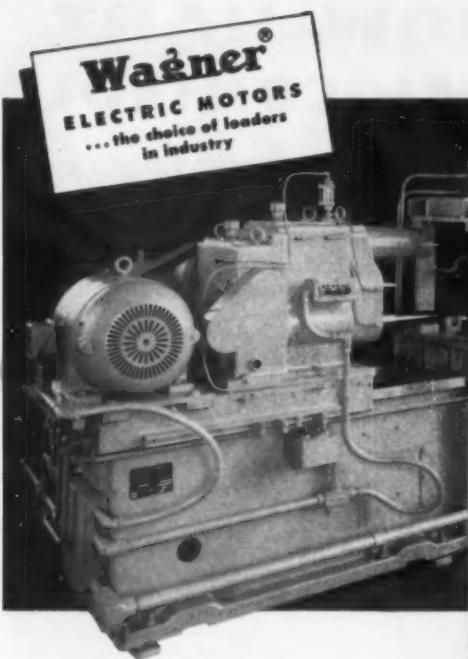
POSITION _____

COMPANY _____

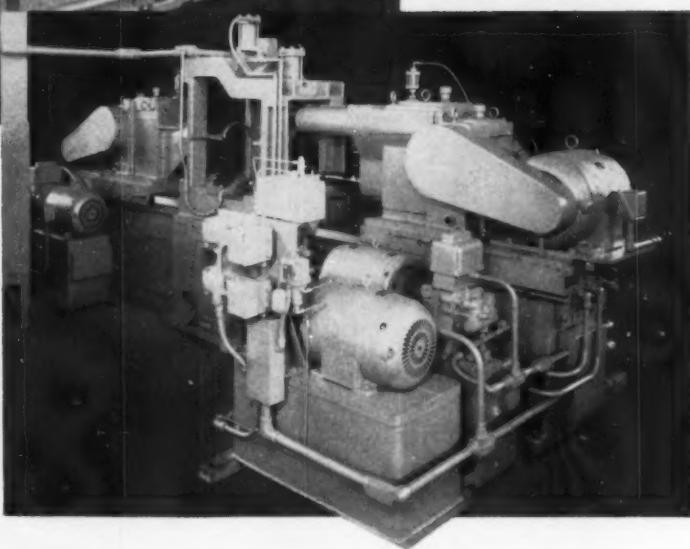
COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

ECM



Moline Tool Company No. MR 140 special boring machine for tractor clutch housings. The machine is equipped with five Wagner Type EP-1 motors, ranging from 3 to 10 hp.



Wagner

Totally Enclosed

MOTORS

mean less down time
for production machinery



Wagner totally-enclosed fan-cooled motors are available in either steel frame or cast iron frame construction, in standard or explosion-proof types, single-speed or multi-speed, 2 phase or 3 phase, in ratings to 250 horsepower.



BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

MS4-18

This Moline two-way, four-spindle boring machine bores, counterbores, faces and chamfers the end holes in tractor clutch housings. Each machine is equipped with five Wagner totally-enclosed, fan-cooled motors (Type EP-1).

The extra protection built into these Wagner Motors means less down time for production machinery. They are totally-enclosed against damage from steel filings, chips, dust, dirt, fumes and moisture. They require no maintenance other than periodic lubrication.

Whatever your requirements may be, there is a Wagner Motor to fit every need—a complete line for all current specifications, with a wide variety of enclosure types and mountings. Bulletin MU-185 gives full information.

Your nearby Wagner engineer can help you select the *right* motors for your needs. Call the nearest of our 32 branch offices, or write us.

WAGNER ELECTRIC CORPORATION
6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

urge your customers to
include a



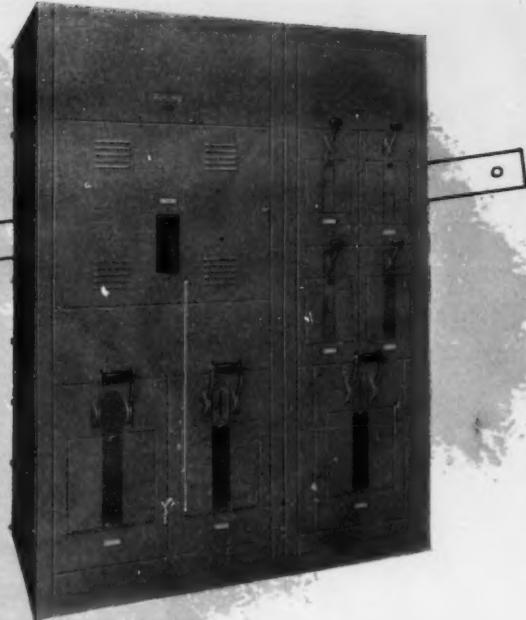
standardized
SWITCHBOARD
in all modernization
or new building plans

Efficiency, safety, dependability, long-lasting and trouble-free service are cardinal virtues of standardized  switchboards.

The reason is that they embody all the latest features in design and operation.

Approved by the Underwriters' Laboratories, Inc., for label service, standardized  switchboards are built of standardized pre-assembled units, incorporated in standardized enclosures.

All switchboards are factory assembled and shipped ready for connection to main and branch circuit cables. Sections are so designed that they



can be used singly or grouped. Removable end walls permit the addition of sections on either side.

If you want to add to the efficiency, safety and economy of your customer's plant operation, urge him to include a standardized  switchboard in his plans for new and modernized buildings.

For further information about these new power centers, contact your nearest  representative listed in Sweet's architectural and engineering file.

THREE TYPES FROM WHICH TO CHOOSE

shutlbrak

a safety type switchboard
designed for frequent
and heavy use.

CAPACITIES:

30 to 1200 amps., 250 volts AC or DC and 600 volts AC 2, 3 and 4 poles. Rotary type operating handles furnished on 30-200 amp. capacities. Straight handles on all others.

klampswitchfuz and snufarc

a combination disconnect switch
and fuse device.

CAPACITIES:

 Klampswitchfuz, 30 to 600 amps., 250 volts AC or DC, 2, 3 and 4 poles, single or double throw.

 Snufarc, 30 to 200 amps., 600 volts AC 2, 3 and 4 poles.

circuit breaker

a safety type switchboard
with thermal-magnetic type
circuit breakers.

CAPACITIES:

15 to 600 amps., 250 volts AC or DC and 600 volts AC, 2 and 3 poles. (Air circuit breakers are used for larger capacities.)

Frank Adam Electric Co.

BOX 357, MAIN P. O. • ST. LOUIS 3, MO.

makers of:
busduct • panelboards • switchboards
service equipment • safety switches
load centers • Quikheler

NEW PRODUCTS

Leviton Heavy Duty Switches
Meet Heavy Duty Demands



CAT. #5301

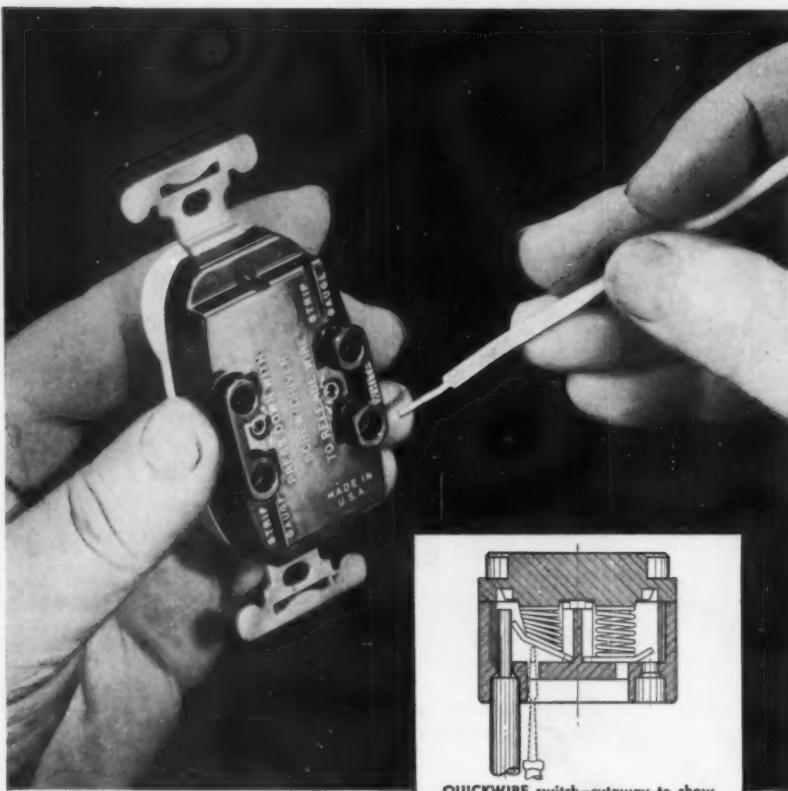
Permanent, solid-riveted construction enables Leviton Heavy duty switches to "take it". Double wiping contacts, of high grade bronze, and large terminal screws, properly angled for ease of wiring, provide switches of superior quality. Fully enclosed in heavily sectioned Bakelite... with plaster ears. Also available in single and double pole or 3-way. Rated 20 Amp. and meets UL and Federal Specifications. Individually packed, each Leviton Heavy Duty switch comes complete with wiring diagram on the box.

LEV-O-LOCK Devices Assure
Power Flow Without Interruption



Connections that *cannot shake loose* when subjected to jarring motion or vibration are possible with LEV-O-LOCK devices. A simple turn of the cap locks cap and connector or receptacle quickly — and tightly. Sturdy construction features assure long life and latest design makes wiring fast and simple. Interchangeable with other standard interlocking devices, LEV-O-LOCK devices are listed by the Underwriters' Laboratories, of course. Available in 2, 3 and 4 wire 10 and 20 Amp. Caps, Connectors and Receptacles.

For complete information write
Leviton Manufacturing Company,
Brooklyn 22, N. Y.



QUICKWIRE switch—cutaway to show
Leviton's exclusive heavy coil spring
pressure connector.

EASILY THE BEST!

— Quick and easy installations are done best with

NEW LEVITON 

spring type, screwless terminal switches and receptacles.

QUICK — because there are no wire loops to make, no screws to loosen and tighten. EASY — because you simply strip the wire and push it into hole. BEST — because Leviton's exclusive heavy coil spring connector holds the wire in place firmly, making permanent contact. To release, simply insert a screwdriver into the release hole.

You save time, money, labor costs when you use QUICKWIRE spring lock switches and receptacles. Simple, easy-to-read instructions are molded into the Bakelite on each device. Deeply recessed wire wells prevent exposure of bare wire. Fully enclosed housing, plaster ears, and handy strip gauge marking on each device.

QUICKWIRE receptacles are available in brown or ivory phenolic. Switches have either brown or ivory toggles and the same famous Leviton switch mechanism — known for service and dependability the world over. And both devices meet UL, CSA and Federal Specifications, of course.

Your best jobs are done with...

LEVITON

For full information write:

LEVITON MANUFACTURING COMPANY • BROOKLYN 22, N. Y.
Chicago • Los Angeles • Leviton (Canada) Limited, Montreal
For Best Results Use Wire By AMERICAN INSULATED WIRE CORPORATION

TIREX CORD
+ Electric Tools
= Dependable Maintenance



Maintenance requires dependable, portable, hand-held tools. These tools are only as dependable as the cord supplying the electricity to run them. Light machinery, electric drills, portable grinders, and trouble lights need dependable cords. TIREX is a dependable, tough, long-wearing, abrasion-resistant cord. Made like a tire, cured in a metal mold like a tire, it wears like a tire.

The copper conductors of TIREX are stranded to obtain unusual flexibility, and are insulated with a high-grade rubber compound. The outer covering is a jacket of carefully compounded "Selenium Neoprene Armor," an exclusive TI-

REX feature. This neoprene armor will retain its flexibility, toughness, and wear-resistant qualities indefinitely. It is resistant to acids, alkalies, flame, greases, moisture, oils, and sunlight.

TIREX has markings molded into the jacket which enable a workman to tell at a glance what kind, size, and type of wire it is. This safety feature ends guesswork and haphazard fitting of tools with cord. TIREX molded markings mean the right cord for the right tool.

Specify and be sure you get Simplex-TIREX Portable Cords from your nearest Simplex distributor, or from the address below.

Simplex

TIREX

CORDS AND CABLES

are made only by the

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.



Here's a good reason why
It's wise to buy
On over-all cost...
not price



Engineered for dependable, economical circuit protection

I-T-E Circuit Breakers keep protection in... "tamperers" out!

Well-meaning operators sometimes eliminate the protective functions of certain types of overcurrent devices—by altering or tampering with vital parts.

"Tamperers" are never a danger where I-T-E Circuit Breakers are on the job. Experience-engineered I-T-E Circuit Breakers provide you with foolproof, efficient performance. Here's why:

- Factory-sealed breaker tripping mechanism prevents calibration from being changed.
- Trip point can never be altered—it's impossible to insert additional heaters, elements, or links.
- Trip-free mechanism prevents breaker from being held closed against faults.

Remember—in electrical protection, *over-all* cost is the cost that counts. Introduce your plant to tamperproof, UL-approved I-T-E Circuit Breakers. They're precision-built to meet the most rigid electrical requirements.

I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

**"TEN REASONS WHY
I-T-E CIRCUIT BREAKERS
PROVIDE THE UTMOST
IN MODERN CIRCUIT
PROTECTION**

1. They offer the highest degree of safety to personnel.
2. They reduce production down-time.
3. They eliminate replacement costs and maintenance.
4. They are completely tamperproof.
5. They are pretested to insure uniformity of operation.
6. They prevent single phasing when a fault occurs.
7. They safely carry their continuous current rating indefinitely.
8. They save mounting space.
9. They offer a wide range of special attachments and enclosures.
10. They incur low watts loss.



I-T-E CIRCUIT BREAKER CO.
Philadelphia, Penna.

The other side of this handy pocket card tells you how to select I-T-E Molded Case Circuit Breakers for various feeder and branch circuits. Write for card and other application data, or see your local I-T-E distributor.

I-T-E Individually Enclosed Circuit Breakers



now!

McGILL [®]
offers
you a complete line of
GROUNDED
PORTABLE LIGHTING



*completely insulated
and shockproof*

model 5025 SLRG

You can now have the safety and convenience of a completely grounded lamp guard equipped with an approved 3-wire convenience outlet. The McGill 5000-G Series portables give you all the light you can use and in addition provide a ready connection for grounding drills, soldering irons, saws or other power tools quickly at the working area . . . without extra extension cords.

McGill grounded guards are available with either the standard closed end cage and reflector or with an open end cage with concentrating end lens (as pictured) to beam light — and rotary reflector. Other models are available with or without convenience outlet, switch, and 25' to 50' of red 16-3 SJT Thermoplastic cord and plug.

*model 151-CA
Lamp changer*

*model 5500-SRG
Grounded, no outlet
closed end cage*



*model 3006
Vaporproof*



*model 7000-SR
Reflector and Switch*



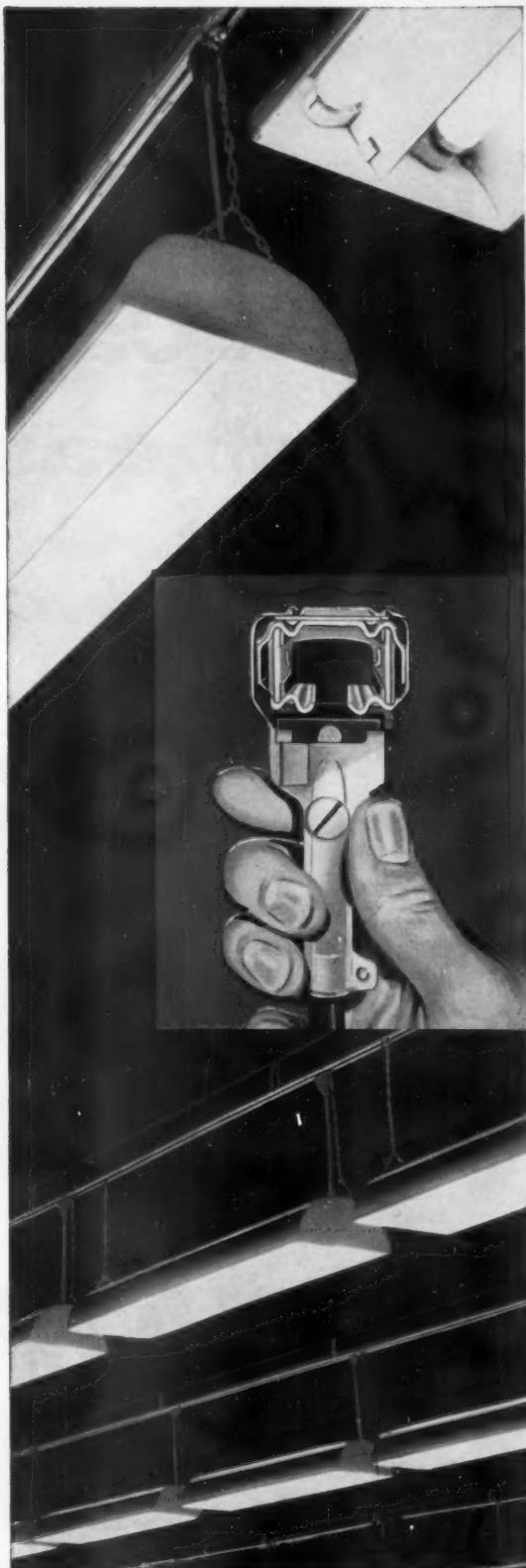
all are McGILL® quality



Send for the new McGill catalog No. 49-A describing the complete line of McGill Lamp Guards, Sockets and Switches.

McGILL [®]
electrical specialties

McGILL MANUFACTURING COMPANY, INC. 450 N. Campbell St., Valparaiso, Indiana



Flexible lighting! These two words describe an ever-growing need in industry and elsewhere—a sound reason for you to sell and install BullDog Universal Trol-E-Duct® the year around.

For Universal Trol-E-Duct is the world's most flexible lighting system. In a plant, it permits lighting fixtures to be moved or added in minutes . . . without rewiring, without downtime, without wasted materials. That's because it's every inch an outlet. Connecting a light is simply a matter of inserting a twistout plug or mobile trolley anywhere along the duct. Adding a light, or a hundred lights, is but a matter of attaching them onto the duct where they're needed. Ideal for light duty or portable hand tools, too.

UNIVERSAL Trol-E-Duct highlights high profits

Don't overlook *any* of the excellent profit possibilities of BullDog Universal Trol-E-Duct. You'll find it sells to stores, offices, hospitals and schools, as easily as to industrial plants. It's easy to install—makes an ideal indoor job for you during slow winter months.

Universal Trol-E-Duct is available over the counter at your BullDog Distributor's. See him, or write: BullDog Electric Products Company, Detroit 32, Michigan. Ask for Bulletin UT-650.

Export Division: 13 East 40th Street, New York 16, New York. In Canada: BullDog Electric Products Company (Canada), Limited, 80 Clayton Road, Toronto 15, Ontario.

©BEPCO

National Electrical Week, Oct. 18-24, 1954

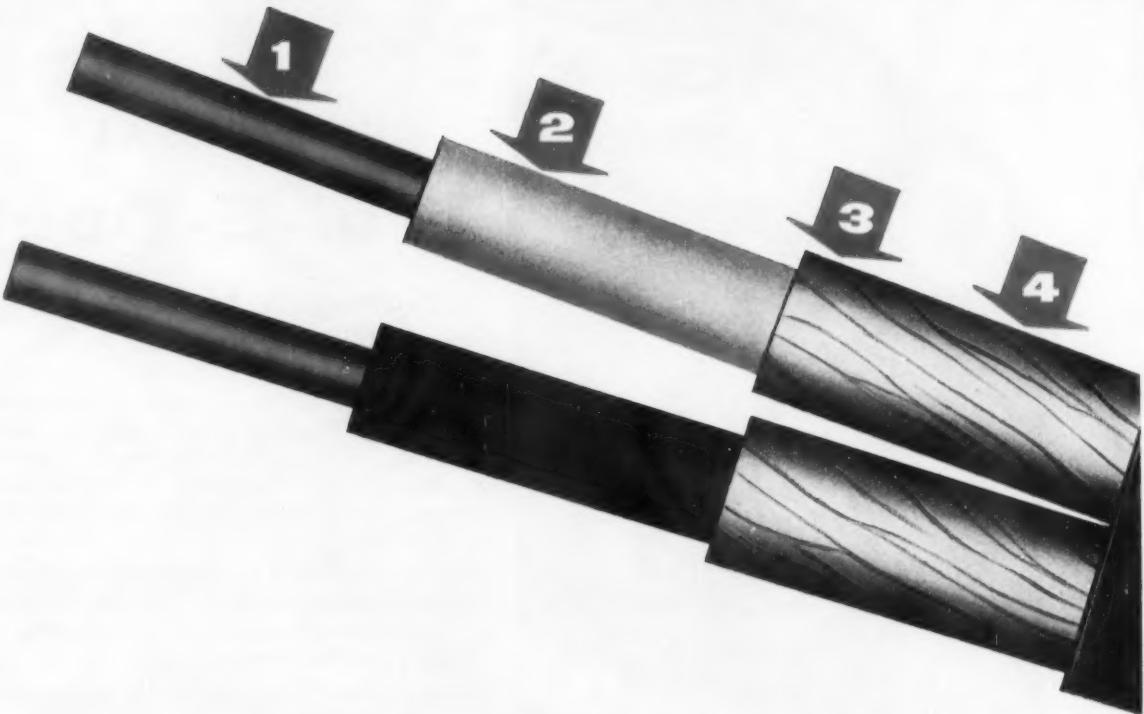
BULLDOG

ELECTRIC PRODUCTS COMPANY
A Division of I-T-E Circuit Breaker Company



Contractors agree...

**You can't beat Phelps
dependable PD-X Cable
fast, easy**



**PHELPS DODGE COPPER PRODUCTS
CORPORATION**

SALES OFFICES: ATLANTA • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS
JACKSONVILLE • DETROIT • FORT WAYNE • GREENSBORO • HOUSTON • KANSAS CITY, MO. • LOS ANGELES
MILWAUKEE • MINNEAPOLIS • NEW ORLEANS • NEW YORK • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE.
RICHMOND • ROANOKE • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON, D. C.

Dodge for stripping!



HABIRSHAW TYPE NM NONMETALLIC-SHEATHED CABLE SAVES VITAL ON-THE-JOB TIME AND MONEY!

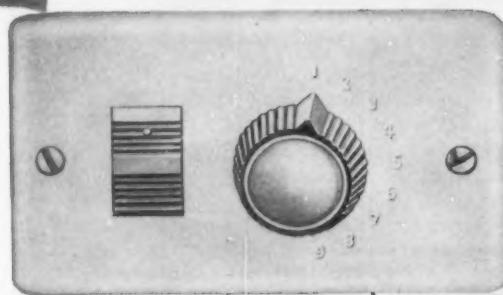
Phelps Dodge Copper Products Corporation's dependable PD-X cable is the fastest-stripping, cleanest-working nonmetallic-sheathed cable on the market today. Here's why:

- 1 Copper conductors are *soft* drawn. Connections are easily and quickly made.
- 2 Habidure Thermoplastic Insulation is clean and smooth—makes stripping *simple, easy, fast*.
- 3 Paper armor is resin-treated to resist moisture, is clean and dry—no oil, grease or wax is used.
- 4 Paper armor is applied with a long twist and can be removed by an easy flick of the fingers. No time-wasting unwinding, no sticking to underlying insulation.
- 5 Barrier tape keeps exterior finishing compounds out of the cable—leaves inside clean and free of gum. *Strips off cleanly as a unit with outer braid covering.*
- 6 Clean, grey finish eliminates sticking, assures *easy pulling*, clean walls and hands.

See Your Phelps Dodge Distributor!

NEW!

RYANT LOW VOLTAGE MULTI-CONTROL WIRING SYSTEM



New profit opportunities for you



For all types of buildings

New System offers advantages of LOW VOLTAGE control of lighting and appliance circuits from conveniently located points.

Added safety and convenience

The BRYANT MULTI-CONTROL Wiring System is the most modern method of controlling electrical circuits. Through the use of small relays, usually mounted in conventional outlet boxes, which are actuated by low voltage switches, lighting and appliance circuits may be economically controlled from one or any number of desired locations. Another outstanding feature, not available in conventional wiring systems, is the Master Switch Control. One or more master switches may be installed at strategic locations for the control of any number of circuits.

This switching system operating on low voltage, is safer and the use of less costly conductors is possible. Flexibility, versatility and economy of installation are outstanding features of this system.

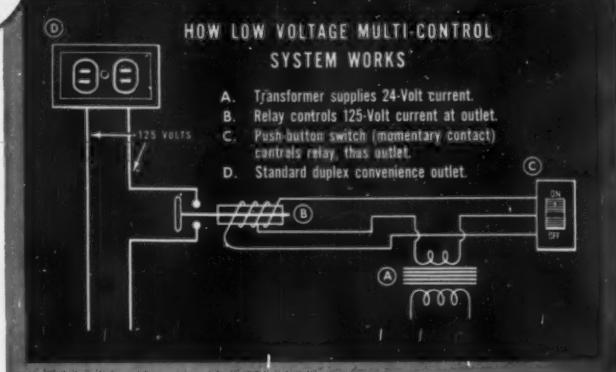


Diagram shows basic circuit of the Bryant system.

For complete information write —

THE BRYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut

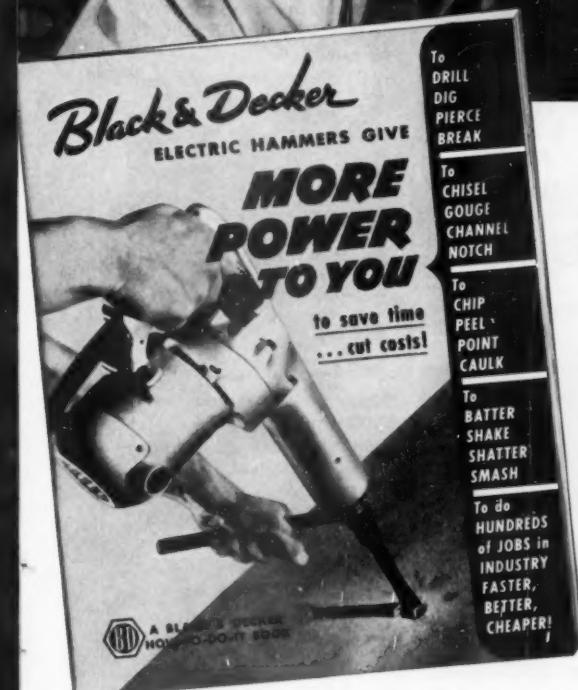
Chicago • Los Angeles



J-99907



Star drilling in concrete for installation of electrical conduit and equipment. Also for breaking through walls and floors for duct work, pipe and fuel line installations.



See where B&D Hammers save you time and money! New Book shows how!

From drilling in concrete to holing-through walls, B&D Electric Hammers get more jobs done faster, better, cheaper! No other Hammer has so many features for comfort and safety. No other Hammer gives you so much working power in so little weight at such a low price! Get all the facts! Get this great B&D Hammer Handbook *FREE!* Page after page of on-the-job photos show how you can save time, cut costs on dozens of jobs in your own operation! Write to: THE BLACK & DECKER MFG. CO., Dept. 617, Towson 4, Maryland. Meanwhile, ask your B&D distributor for a demonstration!

LEADING DISTRIBUTORS EVERYWHERE SELL



Black & Decker
PORTABLE ELECTRIC TOOLS



For nearest distributor,
see "Tools-Electric."



Sell ELECTRIC POWER

WINCE[®]
STORM
MASTER

POWER

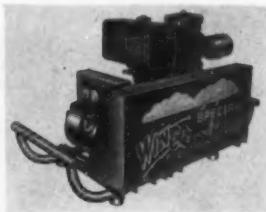
“INSURANCE”

GENERATORS

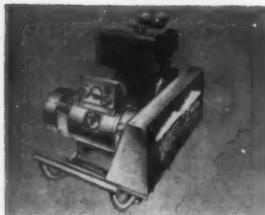
WINCHARGER OFFERS YOU A COMPLETE LINE OF ENGINE GENERATORS



Storm Master
 1800 watts motor starting capacity. Operating capacity up to 1350 watts, 115 volts, 60 cycle A. C.



Special Storm Master
 3030 watts motor starting capacity. Operating capacity: 2000 watts, 115 volt, 60 cycle A. C.



Super Storm Master
 5500 watts motor starting capacity. 3500 watts operating capacity. Supplies both 115 and 230 volt power, 60 cycle A. C. Also available with remote starting.



Giant Storm Master
 8500 watts motor starting capacity. 6500 watts operating capacity. Supplies both 115 and 230 volt power, 60 cycle A. C. Available as either remote start or manual.



10 kw Storm Master
 13,000 watts starting capacity. 10,000 watts operating capacity. Supplies both 115 and 230 volt power, 60 cycle A. C. Remote start.

"INSURANCE"

STANDBY ELECTRIC POWER IS BIG BUSINESS . . .

The sale of electric generators has practically doubled in the last three years. The standby generator market has expanded with the growing suburban home developments and the homeowners' need for dependable power at all times. Also farms and businesses that suffer financial loss when storms knock down power lines are increasingly aware of the need for standby generators. Hospitals and other public buildings are dependent on uninterrupted electricity. Communities are purchasing generators for civil defense units, too . . . another big market.

All these markets have varying electrical demands requiring different sized generators for complete protection from power failures. To take full advantage of the growing standby generator business you need a complete generator line . . . the Winco line.

WHEN POWER FAILS



SERIOUS BUSINESS LOSSES



The Winco Storm Master line is specifically built for today's standby markets

These efficient generators are built to deliver peak performance. Winco's belted construction permits the engine to operate at manufacturer's recommended speed for longer life—assures smooth performance, years of dependable use, service readily available.

And Winco Storm Master Engine-Generators are built to sell! Convenient credit terms and easy monthly payments make purchases easy. And with Winco Generators dealers have substantial profit opportunity.

Specify, sell and install the new Winco Storm Master line of Engine-Generators—the power plants specifically engineered and priced for today's expanding standby markets.

GENERATORS

Sell the construction and contracting markets with the complete **WINCO**® portable engine-generator line

A WINCO Plant . . .



- ✓ Cuts Labor Costs
- ✓ Saves Time
- ✓ Speeds Production



And WINCO really sells . . .

Here's what the dealers say . . .*

"We sell them almost on sight by demonstrating what they can do."

"Expect to sell 30 or 40 a month."

"Never handled a line that caught on so quickly."

"Demonstration selling almost always sells a generator to the builder."

"Tremendous success in the sale of Winco Generators."

500 to 10,000 watts, Winco Generators are Economy Engineered for full power and excellent inherent voltage regulation . . . ideal power plant for builders, contractors—anyone using power tools away from hi-line power. Write for full particulars.

*Names and addresses on request.

WINCHARGER CORPORATION

Sioux City 2, Iowa

A wholly-owned subsidiary of ZENITH Radio Corporation

Get all the facts on the Winco Storm Master Line
MAIL THIS COUPON NOW

WINCHARGER CORPORATION, Sioux City 2, Iowa

Gentlemen: Please send full facts on your Winco Storm Master Standby Engine-Generator line.

Name _____

Address _____

City _____ State _____

for the best in Time Switch Performance:

...use Sangamo Heavy Duty Time Switches



Unfailing on-off control . . . that's what you get when you specify Sangamo Heavy Duty Time Switches. No detail has been overlooked to offer you a time switch which represents the utmost in accuracy, sturdiness and dependability.

Sangamo Heavy Duty Time Switches are available for almost any conceivable application from the simplest on-off operation — to complex multi-operation schedules.

1. **Slow Speed Motor.** Powered by the famous Sangamo 450 r. p. m. hysteresis motor. Quiet, requires no oiling and never needs repairs. Keeps operating under wide temperature variations.
2. **Long Service Life** is assured by solid silver contacts of "minimum-arc" design and bronze bearings at points of greatest wear.
3. **Available with Automatic Carryover and Astronomic Dial.** Automatic carryover assures continued operation for up to 10 hours in event of power failure. Astronomic dial controls switching schedule in accordance with sunrise and sunset . . . and compensates daily for the progressive changes in seasons.

Have you tried the Low Priced Type B?

Here's a time switch with high Sangamo *quality* at a new, low price . . . a switch you can install and forget . . . a switch that will go on working without constant attention. It has the same low-speed, hysteresis motor with the same maintenance-free features as the heavy duty model.



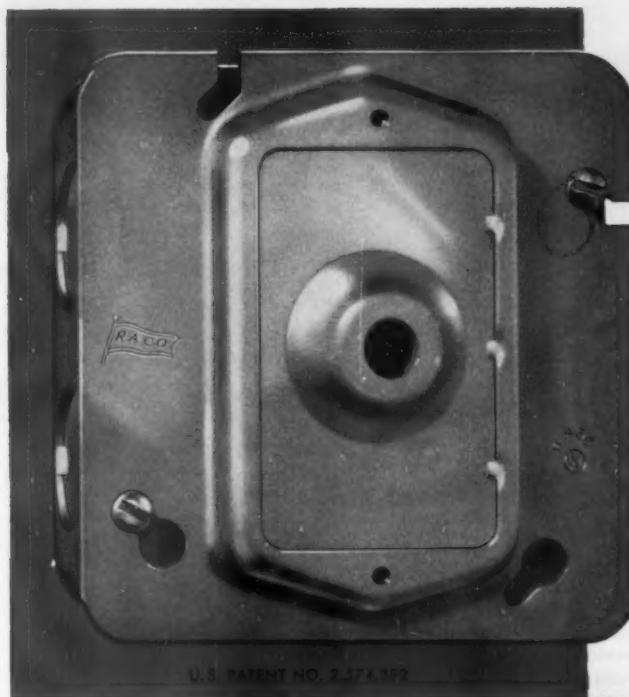
The Sangamo Type B wipes out the service headache. When you install it, you're spared the wasted expense of call-backs due to motor failure, jammed levers, burned contacts or stuck dials. Sturdy, attractive, all-steel case with hinged cover and sealable hasp . . . anyone can operate it . . . installs easily—case is designed so there's wiring room in almost half the inside space . . . $1\frac{1}{2}$ " to $3\frac{1}{4}$ " multiple knockouts . . . NEMA Standard 30 ampere rating . . . single pole, single throw construction . . . long life solid silver contacts and bronze bearings at points of greatest wear.

* Your electrical wholesaler can furnish all types of dependable Sangamo Time Switches. See them before you specify time control for your next installation. Insist on Sangamo—for the best in time switch performance.



SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS



U.S. PATENT NO. 2,574,382

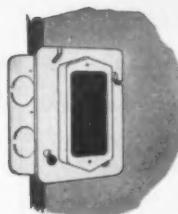
NEW RACO LOCATOR COVER

**MAKES IT EASY TO
FIND OUTLET BOXES
IN NEWLY PLASTERED
WALLS**

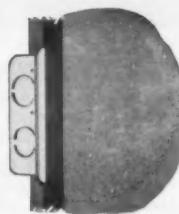
**COMPARE THE COSTS
PER OPENING!**

No. 788— $\frac{1}{2}$ " Raised • No. 789— $\frac{3}{4}$ " Raised

**THE OLD WAY
cost—dollars**



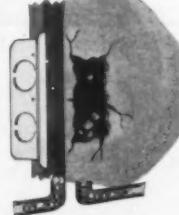
Box and device ring installed ready for the plasterers. Opening is unprotected. Location is unmarked.



Plastering completed. Some boxes may be completely covered by plaster.



Box located by tapping or painting wall with water. Plaster fragments fill box and conduit. Plaster cracks.

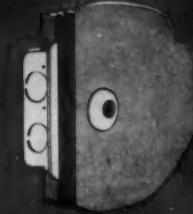


Both box and conduit must be cleaned. This is time consuming and costly. Plaster requires patching.

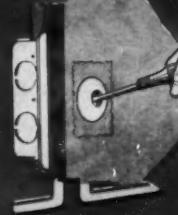
**THE NEW RACO WAY
cost—pennies**



Box and device ring with Raco Locator KO are installed. Opening is protected and location is marked.



Plastering completed. Box hidden by plaster. Locator is easily found.



A screwdriver in Raco Locator KO is bent back and forth. Excess plaster breaks cleanly. Box is free of debris.



Plaster edges are clean and sharp. Wiring and device installation can be done at once. No plaster problems.

WRITE TODAY!

Get complete information on
RACO Locator Covers



ALL-STEEL EQUIPMENT INC. AURORA, ILLINOIS



LIGHT

—for Sight and Sales

... with Fixtures by LITECONTROL

Lighting by LITECONTROL is an important member of the sales staff in this Fanny Farmer store.

LITECONTROL's Luminous Lens Ceiling Panels bathe every surface in a flattering, even illumination...show merchandise in its *best* light, without ugly shadows, glare or harsh contrasts.

Note entire surface of each panel

is aglow. Holophane No. 9015 Low Brightness Lenses make display light but not bright, just right for sweet selling.

Why not discover for yourself the

selling magic in standard lighting fixtures that are fashioned right for good sight, good looks and easy maintenance — see your local LITECONTROL Representative.



LITECONTROL *Fixtures*
KEEP UPKEEP DOWN

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

RESULTS OF AN INTELLECTUAL REVOLUTION . . .

"The Western Miracle" Continues . . .

More Automatic Controls for Industry

Within recent weeks three new monthly technical magazines devoted to automatic control systems for industrial processes and machinery have offered the public their first issues. One of these is CONTROL ENGINEERING, a McGraw-Hill publication.

What has caused this surge of interest in the design and application of automatic control systems? What does it portend for the future of American industry? More important, what does it promise for the American standard of living, of which industry is and must be the servant? And what is the role of CONTROL ENGINEERING in this development? It is to those questions that this statement is addressed.

A New Intellectual Revolution

It is frequently asserted that we are now in the throes of a new industrial revolution. The revolution is described as the eliminating of wasteful applications of human labor to repetitive tasks through new technology which makes it possible to transfer those tasks to automatically controlled machinery.

It is perhaps more accurate, however, to say that we are the beneficiaries of a new intellectual revolution in the application of science to industry. This new intellectual revolution points the way toward giant strides in the continuing proc-

ess of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control.

The practical engineering work required to convert this intellectual revolution into a full-scale industrial revolution, however, in large part still remains to be done. It is to this task that CONTROL ENGINEERING will be devoted. Its role is that of bridging the gap, in engineering and economic terms, between the new conceptions of automatic control of industrial processes and their practical workaday application. These conceptions run the full gamut from systems of control for automatic factories making heavy industrial products to highly personalized systems of automatic control to warn people when they are approaching the broiling point in sunning themselves at the beach or becoming too drowsy to drive their cars safely.

Enter the "Feed-Back" System

Enough work has been done to move these conceptions out of the realm of interesting dreams and into the realm of practical possibilities, and in some cases into the realm of practical realities. Crucial parts of this work were done during World War II when weapons were successfully equipped with "feed-back" systems

that automatically corrected mistakes made by the weapons in locating their targets.

The principle of the "feed-back" system is as ancient as the personal monitor that tells us not to run into each other as we walk along the street. It feeds back to our locomotion machinery the warning of a collision ahead. But the application of the principle to weapon control and then to more general machinery control required superlatively imaginative and skillful scientific development.

When a "feed-back" system that monitors an automatic process and keeps it lined up precisely is teamed up with a computing machine, capable of making lightning calculations that control both what goes into the process and what is done with the product, the horizons of automatic control become broad indeed. But in large part they still remain horizons. A vast range of practical engineering work remains to be done to realize anything like the full potential of automatic control of industrial processes and machinery.

More and Better Jobs

There are those who view the surge of interest in automatic control with alarm. They conjure up a situation in which automatic processes will at once expand the ranks of the unemployed and reduce many of those still working in industry to the status of robots or automatons.

A look at the record of the American economy — a record of amazing growth, steadily improving job opportunities and a constantly rising standard of living — demolishes the basis for such fears. The introduction of new and more efficient industrial machinery and processes obviously cannot be accomplished without creating some disturbance for some individuals and some companies. But consistently the longer range effect of such local and temporary disturbance has been more jobs and better jobs for Americans.

It is no accident that, while the proportion of industrial wage earners in our population is virtually the same as it was in 1920, the pro-

portion of professional and salaried workers has doubled. The proportion of unskilled workers, furthermore, has dropped by half. This has been an essential part of a continuing process by which drudgery has been transferred to machines while the workers who formerly did the drudgery have been graduated to jobs calling for greater competence and providing better pay.

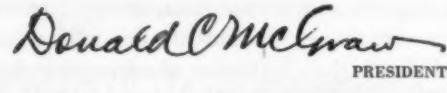
Higher Living Standard

A British historian, H. J. Hancock, has referred to this general process as "the Western miracle" — that of providing an ever higher and higher standard of living for more and more Americans. The key element in this miracle has been more and more reliance on power-driven machines to get the day's work done.

In the nature of the extremely complicated apparatus involved, full development of systems which have passed through the "think stage" into the status of practical possibilities will be a time-consuming process. It will also be a very exacting process, calling for a tremendous application of engineering skill and ingenuity. However, the engineers who are concentrating on this difficult, workaday phase of the development of apparatus for automatic control will be inspired by the knowledge that they are making a crucial contribution to technical progress which holds great promise of good for the American people.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.


Donald C. McGraw

PRESIDENT

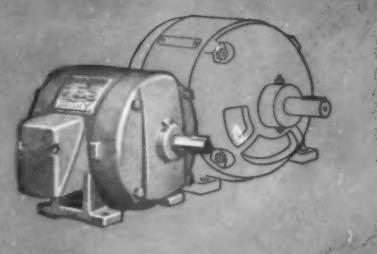
McGRAW-HILL PUBLISHING COMPANY, INC.

8 reasons why you should MODERNIZE EQUIPMENT WITH **TRI 55 CLAD MOTORS**

REG. U.S. PAT. OFF.

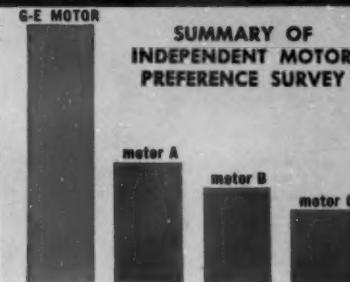
Plan now to modernize your equipment with the all-new General Electric Tri/Clad '55' motor, available now in many ratings; entire line of 1 to 30 hp a-c motors available soon. Contact your G-E Representative. General Electric Company, Section 648-6, Schenectady 5, N. Y.

MORE POWER PER POUND



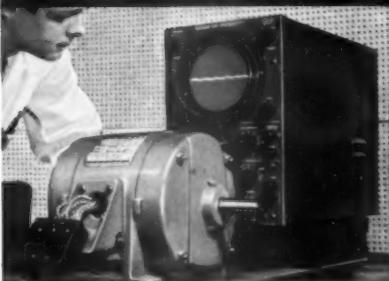
Lighter and smaller Tri/Clad '55' motors in new NEMA frame sizes and ratings save you space and weight, reduce handling costs.

BUYER PREFERENCE



You take advantage of a 2 to 1 buyer preference for the electric motors on your equipment when you buy or specify a G-E motor.

BETTER PERFORMANCE



Quieter operation, proved by sound-room tests, is typical of the many performance improvements in the new G-E Tri/Clad '55'.

LONGER LIFE



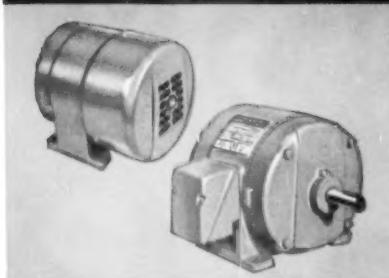
A silicone Dri-film* coating makes insulation shed water—lengthens motor life. Polyester-film insulation is 8 times stronger.

EASIER INSTALLATION

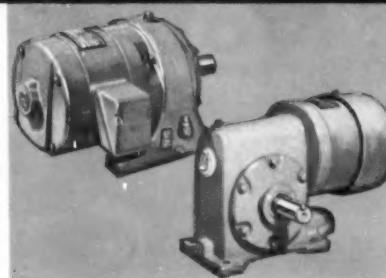


Perma-numbered leads are always instantly read even when wires are taped or clipped. Conduit box has plenty of knuckle room.

COMPLETE LINE OF NEW MOTORS



A complete line of new motors assures the right electrical drive for your machine. Write for Bulletin GEA-6013 on drip-proof motors,



GEA-6012, on enclosed motors. For low speed jobs, G.E. offers a complete line of gear-motors. Write for Bulletin GEA-6027.

NEAR-BY SERVICE

CLASSIFIED
Electric Repair Service
—(Continued)
GENERAL ELECTRIC
SMALL MOTOR SERVICE STATION

Complete facilities for in and out-of-warranty repair and exchange of A-C and B-C motors and generators to 15 HP. Authorized distributor of G-E motor renewal parts and G-E single-phase motors.

"WHERE TO CALL"
AUTHORIZED G-E MOTOR SERVICE
Street Address..... Phone No.



G-E service is as close as your telephone. Authorized motor service stations provide repair-facilities in all major trading areas.

*Reg. trade-mark of General Electric Co.

Progress is our most important product

GENERAL  **ELECTRIC**



Harrisburg, Pa., Contractor says . . . "I'm sold on G-E Ballasts — so are my customers!"

Mr. Charles E. Bashore, co-owner of the Edwin L. Heim Co., Harrisburg, Pa., has been serving important customers in the Harrisburg area for more than 20 years. When asked why he consistently uses G-E ballasts on fluorescent lighting jobs, he said:

"Ballasts are mighty important to a good lighting job so naturally I use the best I can get. In my opinion, that means G-E. There are a lot of things I like about G-E ballasts. For one thing, I know from experience they can be counted on to give long, dependable service. Another is that G.E. makes a full line of

ballasts, and, they don't cost any more than other good ballasts.

"Those are a few reasons why I'm sold on G-E ballasts. But I'm not the only one—so are my customers!" Top quality control and modern manufacturing techniques account in part for the popularity of G-E ballasts with men who know the lighting business.

On your next job, be sure to specify General Electric ballasts. Your lighting equipment distributor should have them.

FREE! Mr. Contractor, we have for you one of the most useful publications ever prepared on ballasts. It's a cross-reference chart which tells you at a glance the catalog numbers of the right G-E ballast to replace ballasts of other manufacturers. It will make it easy for you to use G-E ballasts for replacement. Get your copy today — free, of course! Mail this coupon.

General Electric Co.
Section A401-12
Schenectady, N. Y.

Send me a free copy of your cross-reference guide on Ballasts (GED-2416).

Name

Address

City State



GENERAL  **ELECTRIC**

THE THREE CUTLER-HAMMER STARS ★ ★ ★
STAND FOR THREE NEW STANDARDS



Installs easier

The cost of installing motor control today is usually much more than the cost of the control equipment, often two to three times as much. Thus this new control offers large savings.



Look for the three silver stars on the famous Cutler-Hammer nameplate; they identify the new spectacular Cutler-Hammer ★★★ Motor Control. These three stars stand for three entirely new standards in motor control satisfaction and value. ★ 1 . . . Easier, faster, lower cost installation any electrician can readily prove. ★ 2 . . . Time-saving, trouble-saving, cost-cutting better performance which any test will confirm. ★ 3 . . . Amazingly longer life due to advanced engineering features anyone can understand. Compare it by features and by performance. You too will say it is the finest control you know. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wisconsin.



Works better

Users say, "Nothing like this ever before." Smooth, quiet operation with uniform response. New adjustable overload protection lets motors work harder with fewer nuisance interruptions.



Lasts longer

Revises all existing ideas of long trouble-free life in motor control. Cuts rate of wear to point that maintenance care and cost are virtually eliminated for 90% of all control uses.

*TRY IT!
COMPARE IT!
TEST IT!
PROVE IT!*

Order from your nearby
Authorized Cutler-Hammer
Distributor today.



CUTLER-HAMMER ★★★ MOTOR CONTROL

If you sell, specify,
or install electrical
wiring devices



:
make it

P & S

Designed for
Easy Wiring . . . for Hard
Usage Year after Year

P & S PULL LAMPHOLDERS

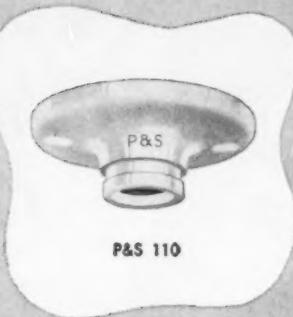


P & S 4046-2

Feature one-piece construction — no separate shadeholder ring to loosen and fall off. Built-in mechanism of simplified design with terminal screws in most get-at-able position, eliminates necessity of removing interior to wire.

For 3 1/4" box — P & S 4026 with insulated chain, P & S 4026-2 with short chain and cord. For 3 1/4" and 4" boxes — P & S 4046 with insulated chain, P & S 4046-2 with short chain and cord.

P & S KEYLESS LAMPHOLDERS



P & S 110

Practically every wiring installation calls for one or more of these lampholders. Strictly utilitarian, yes — but made of fine P & S porcelain with a quality P & S interior, they will give years of trouble-free service.

For 3 1/4" box — P & S 41.

For 3 1/4" and 4" boxes — P & S 110.

P & S PULL LAMPHOLDERS with CONVENIENCE OUTLETS



P & S 5046-2

Have same one-piece construction as the P & S 4026 Line, PLUS a convenience outlet connected internally — no extra wires, soldering or taping. Ideal for attic, basement, garage, etc., where inexpensive lampholder with outlet is desirable.

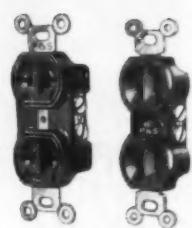
For 3 1/4" box — P & S 5026 with insulated chain, P & S 5026-2 with short chain and cord. For 4" box — P & S 5046 with insulated chain, P & S 5046-2 with short chain and cord.

P & S 1530 and 1570 — The OUTLETS with COMPLETELY INSULATED BACKS

Both P & S 1530 and P & S 1570 are easy to wire. Large head binding screws are spaced far apart — bodies are shorter, leaving more room in box. Plate screw hole in strap — no rivet to twist or turn. Both outlets have long-life phosphor bronze contacts — washer type ears — easy find slots.

P & S 1530 (brown) and P & S 1530-I (ivory) — T slot type.

P & S 1570 (brown) and P & S 1570-I (ivory) — Parallel slot type, double grip contacts.



P & S 1530 P & S 1570

Illustrated are just a few of the hundreds of wiring devices in the complete P & S line. All lampholders shown conform to Fed. Spec. W-L-142. Outlets conform to Fed. Spec. W-R-151. Every P & S device is a quality device — the result of experienced engineering, precision manufacturing and rigid inspection. Every P & S wiring device is BUILT TO LAST.

**YOU CAN'T AFFORD LESS
THAN THE BEST**

**Write Now for Catalog
Address Dept. M**

PASS & SEYMOUR, INC. SYRACUSE, N. Y.

OFFICES: 71 Murray St., New York 7, N. Y. • 1229 W. Washington Blvd., Chicago 7, Ill.
In Canada: Renfrew Electric & Refrigerator Co., Ltd., Renfrew, Ont.



With Allis-Chalmers Type H Starters, your motors, cables and associated equipment are protected against short circuits by fast-acting current limiting fuses. These fuses cut off short circuit current at a *low safe peak value*. The short is cleared in less than a half cycle . . . thus minimizing the possibility of damage.

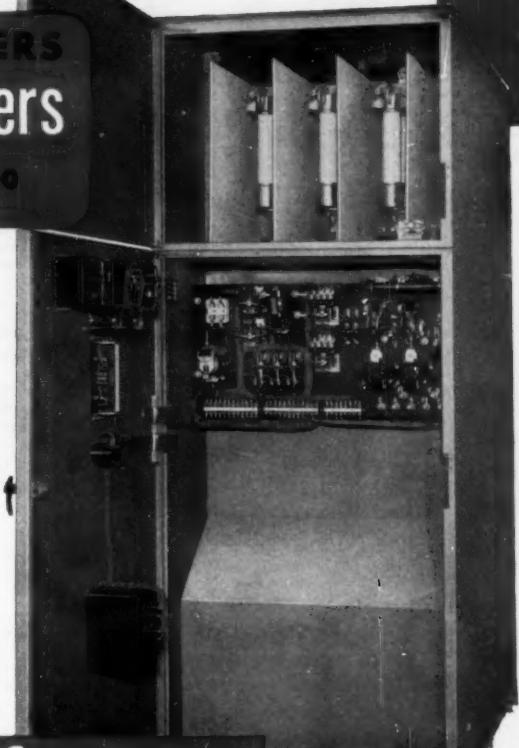
Noiseless, Safe, Positive

Action is silent. An indicator in the end of fuse reveals occurrence of short. Blown fuse emits no gas, flame nor vapor . . . discharges no metal. Flashover caused by ionized vapor is eliminated. Fuses will not blow unnecessarily . . . protection against locked-rotor or single-phase conditions is provided by overload relays coordinated with fuses.

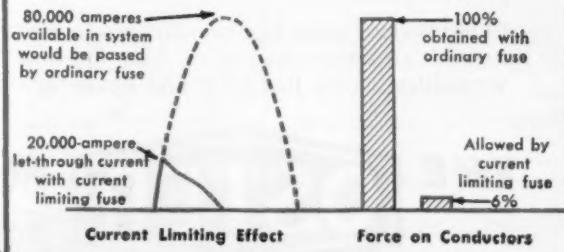
The FULL Protection Starter

Quick action short circuit protection is a part of the *Full Protection* engineered into a Type H starter . . . complete, positive protection which permits men to work in safety, guards motors and machines against costly damage, lengthens equipment life, increases production by reducing down time. Get all the facts from your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4368



Compare . . .



ALLIS-CHALMERS

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . OCTOBER, 1954



OSTER

LIGHTWEIGHT CHAMP

Makes Dies Work Better... Longer

An exclusive Oster design feature found on the Lightweight Champ is the two driving arms on center line with spindle. They even up the load on the die stocks . . . prevent excessive strain and wear on one side of the die. As a result dies last longer and produce the accurate threads that mean a good job every time.

Other features of the Lightweight Champ help make it an outstanding value. Like the new wrenchless chuck that grips and holds tight

in either right or left hand direction; revolving non-binding rear chuck; easy access to either motor or switch. The Lightweight Champ has an all-welded, steel case . . . absolutely indestructible . . . guaranteed for the life of the machine. But, in spite of the tough, rugged construction, it is easy to move from job to job. The standard range is $\frac{1}{8}$ " to 2". Range with drive shaft is $2\frac{1}{2}$ " to 8".

For complete data, write us or, better still, contact your local Oster distributor.

THE **OSTER**

MANUFACTURING CO.
Main Office and Factory:
2081 East 61st St., Cleveland 3, Ohio

Builders of Cost Reducing Threading Equipment Since 1893

IT'S NEW!
IT'S BLUE!

... the plastic tape for bundling

SPANGLEAM



Now . . . all SPANGLEAM EMT in sizes ranging from $\frac{1}{2}$ " to 2" is shipped to you neatly bundled in the new blue plastic tape! It's another SPANG first—and everybody benefits from this new packaging!

BETTER FOR ELECTRICAL CONTRACTORS—because the plastic tape keeps the SPANGLEAM EMT bundle tight until you're ready to break open the package . . . makes EMT easier to transport and handle on the job . . . prevents slippage of individual lengths.

BETTER FOR SPANG DISTRIBUTORS—because the new plastic tape makes SPANGLEAM EMT easier to store, easier

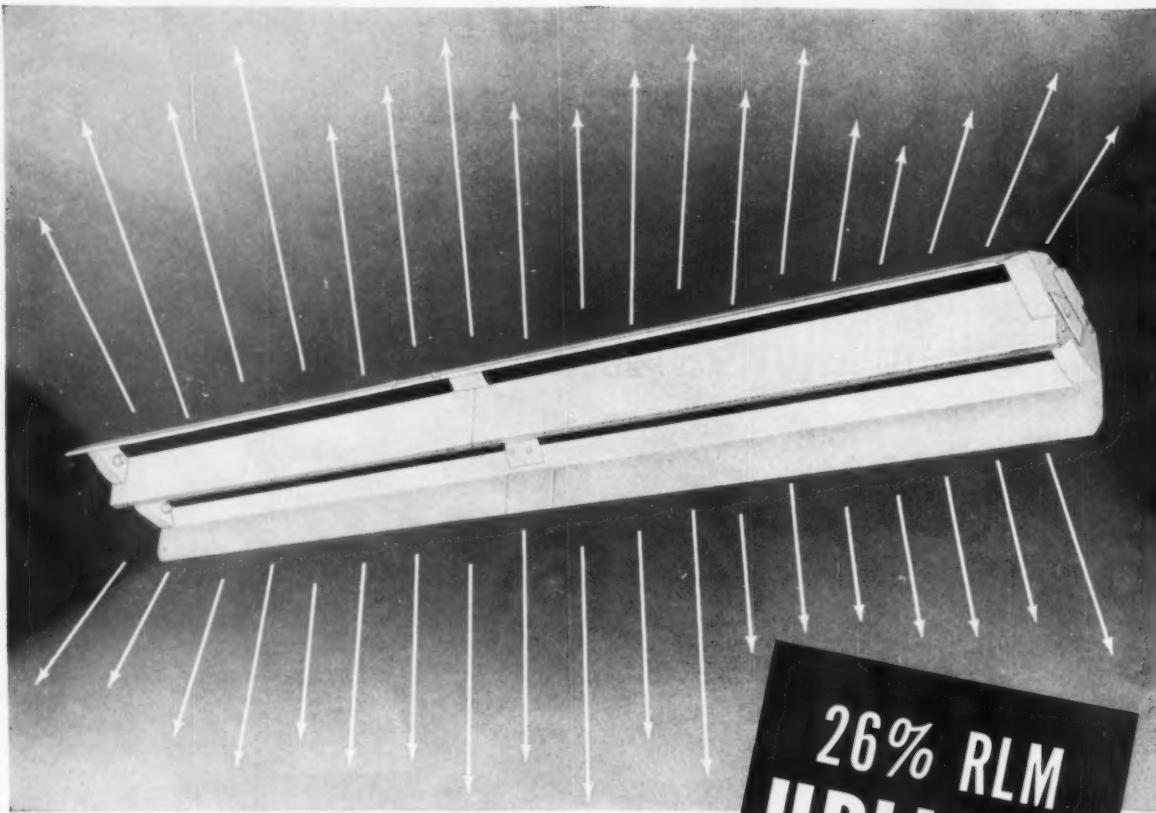
to identify in warehouse stock, easier to inventory . . . presents a clean, neat appearance . . . no rope marks mar the SPANGLEAM finish.

AND IT'S BETTER FOR SPANG, TOO—because the new plastic tape eliminates hand bundling . . . saves production time . . . speeds up deliveries.

Look for the new blue plastic tape bundle on SPANGLEAM EMT. It marks a *top-quality* product . . . the same *top quality* you find in all SPANG tubular products. Your SPANG Distributor has a complete line of all SPANG Conduit and fittings.



New Perspective on Industrial Lighting



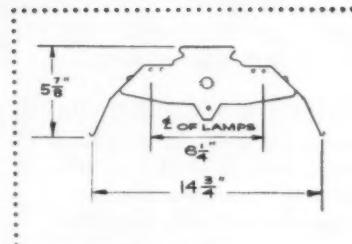
New Electro Silv-A-King

Electro Silv-A-King now brings you this 26% RLM approved Uplight fixture, with these outstanding features . . .

- Cast Aluminum Ends
- Continuous Run Mounting Without Costly and Time-Consuming Couplers
- All Units May Be Used for Individual or Continuous Mounting
- Reflector Locking Method for Low Cost Installation
- 89% Efficiency—With 32% Side Shielding
- Available with Louvers for Longitudinal Shielding

This new Electro Silv-A-King Uplight fixture brings industrial ceilings out of the shadow and thus improves over-all seeing conditions—and plant appearance. Actual tests have proven this new open-top reflector keeps lamps and reflecting surfaces cleaner longer—thus maintaining a higher lighting level over longer period of time—an important economy.

Available in lifetime porcelain or baked enamel finish. Fluorescent and Rapid Start: 2 Lamp 4-ft. 40 Watt 4 Lamp (in tandem) 8-ft. 40 Watt Slimline: 2 Lamp 4-ft. 2 Lamp 6-ft. 2 Lamp 8-ft.



SEND FOR COMPLETE CATALOG



Electro Silv-A-King Corporation

1535 SOUTH PAULINA ST., CHICAGO 8, ILL. • SPRUCE AND WATER STS., READING, PA.

Roller-Smith

INDIVIDUALLY ENCLOSED

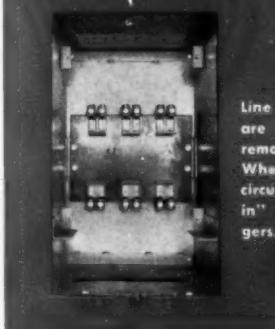
Air Circuit Breakers

Roller-Smith individually Enclosed Air Circuit Breakers have become increasingly popular with **QUALIFIED** Electrical Contractors, Industrials and Utilities because of their safety features and the extreme ease with which they can be installed and maintained.

From 15 to 600 ampere rating—600 volts, the RS-15A provides 15,000 amperes interrupting capacity; RS-25A 25,000 amperes. Also available in higher current ratings (up to 4,000 amperes) and interrupting capacities to 100,000 amperes.



Breaker can be padlocked to prevent use and insure safety to maintenance men working on the "line." Interlock automatically throws breaker to "OFF" position when front cover is removed. Available for either electrical or manual operation. Designed for wall mounting, close ganging or overhead suspension.



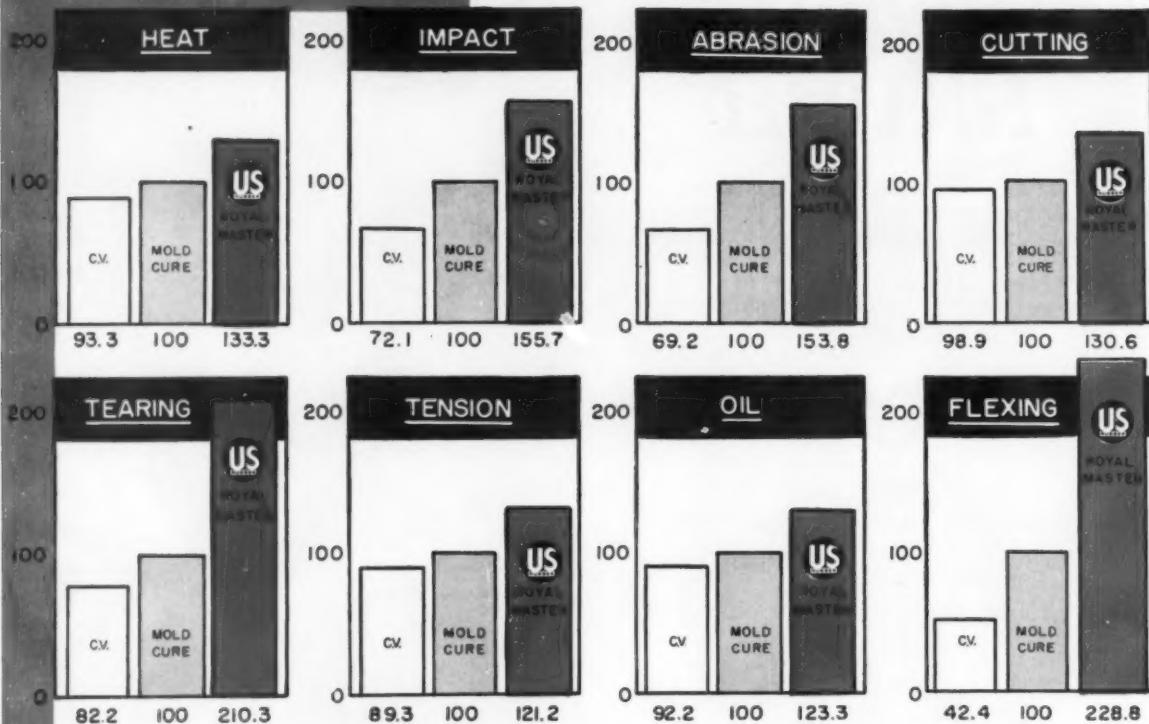
Line and load side connections are made with Circuit Breaker removed to facilitate wiring. When installation is completed, circuit breaker simply "plugs in" to stationary contact fingers.

Roller-Smith
CORPORATION
ELECTRICAL SWITCHGEAR
BETHLEHEM, PENNSYLVANIA

Available thru Authorized Wholesalers.
Sales Representatives in all principal Cities.
CANADIAN FOREIGN

New

U.S. ROYAL outperforms,



Comparative performance of portable cords related to major life factors.

Graphs illustrate the outstanding superiority of new U. S. Royal Master Cord — over the average of molded cords and the average of short-lived continuous vulcanized cords of other makes — on every major life factor. (Average of other molded cords is rated at 100%.)



UNITED STATES
ELECTRICAL WIRE AND CABLE DEPARTMENT

MASTER portable cord outlasts all others!

Comparative tests show U. S. Royal Master gives \$1.88 in value for every \$1.00 spent—almost twice the service value of the average of other molded cords!

LOOK FOR THE NAME—U. S. ROYAL MASTER



Two years ago, "U. S." engineers began a *complete reexamination* of portable cord construction, service life, and the causes of cord failure.

Over 10,000 tests were made. More than a thousand cords of all leading makes, including our own famous U. S. Royal Cord, were analyzed, tested, and compared.

Every life factor was considered and carefully evaluated, alone and in its relation to overall cord performance and service life.

Backed by 64 years of experience in the manufacture of electrical wire and cable, U. S. Rubber engineers then translated their findings into an entirely new portable cord, designed to surpass any other previously made.

Extensive tests, both in the laboratory and in outside plant installations have proved this new portable cord startlingly superior in every respect!

New U. S. Royal Master is unquestionably the finest cord you can buy!

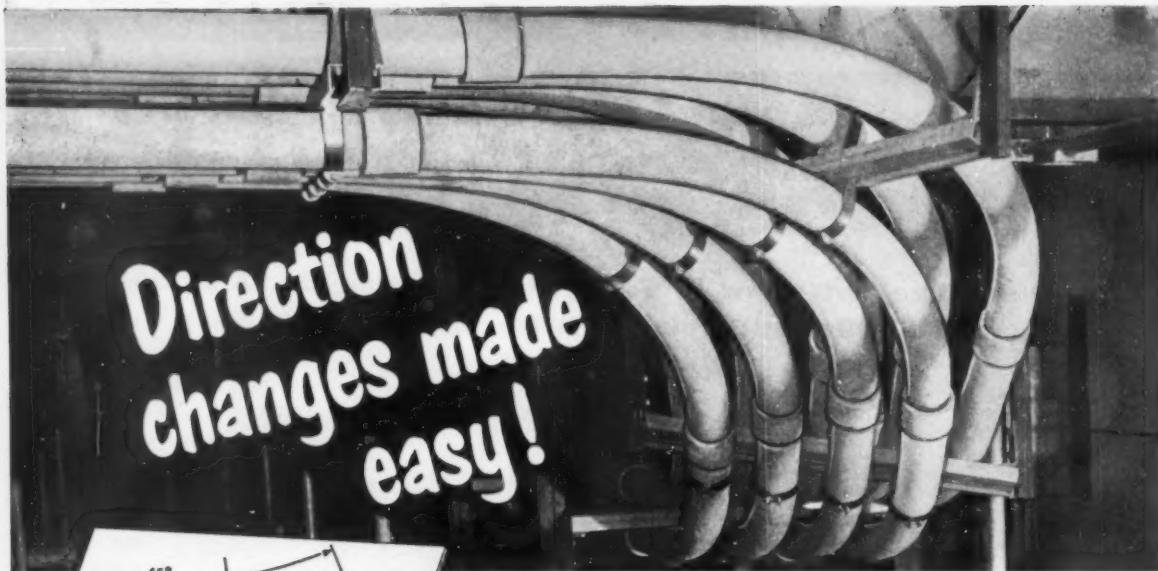
From every standpoint, as the charts at left illustrate, new U. S. Royal Master is a finer, more durable cord—actually gives 88% longer life than the average of competitive molded cords—far longer than *any* other cord—surpassing even a hypothetical cord incorporating the best features of all those tested!

For greater value, too! In spite of almost doubled service life, this great new cord is in the same price category as other molded cords—giving you \$1.88 in cord value for every cord \$1.00!

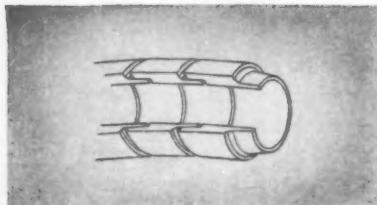
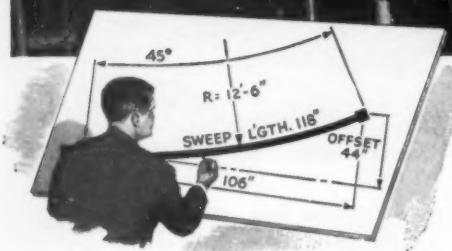
Prove to yourself the outstanding superiority of new U. S. Royal Master Portable Cord—in both service life *and* economy! Get in touch with your "U. S." distributor today!

Approved by Underwriters' Laboratories, Inc.

R U B B E R C O M P A N Y
ROCKEFELLER CENTER, NEW YORK 20, N. Y.



(Photograph courtesy of ELECTRICAL WEST.)



5° bend segment sketched in detail. It consists of a straight section of Transite stock with a male taper on one end and a female taper on the other . . . each machined at an angle of $2\frac{1}{2}^{\circ}$ to the center axis. Segments can thus be used single, or combined to form bend sections whose curvature is any multiple of 5° .



Photograph showing use of bend segments and curved segments with Transite Ducts.

Direction changes made easy! . . . with standard fittings for TRANSITE asbestos-cement DUCTS

When you use Transite Ducts, you have available a wide variety of standard fittings, made of the same asbestos-cement material as the ducts themselves. These fittings save time and expense because they provide maximum flexibility in laying out or constructing a duct system. They facilitate clearing unexpected obstructions or accommodating revisions in the original layout.

For instance, the new Transite 5° Bend Segments (shown at left) can be used alone to form simple and complex curvatures of any multiple of 5° . Used with other standard Transite curved fittings, they form curvatures of odd degrees. Thus, they enable you to simplify cross-overs

and transformations . . . to clear obstructions . . . to form unusual or special bend or offset sections. They eliminate the need for purchasing special radii bends or sweeps. The other standard Transite fittings that facilitate directional changes are the offset bends, standard 45° and 90° bends, sweeps, curved segments, laterals, tees, elbows and deflection couplings.

For complete information write for new brochure EL-45-A, "Fittings and Dimensions of Transite Ducts." Contains all dimensional data required by the designer. Also available, "Transite Duct Underground Installation Sheet," EL-43-A. Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto, Ontario.

5 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

- 1. Corrosion-Resistant.** Transite, being made of inorganic asbestos and cement, resists corrosion and is immune to electrolysis.
- 2. Permanently Smooth Bore.** Transite makes long cable pulls easy, under any conditions. Danger of damage to cables is also minimized.
- 3. Incombustible.** Transite will not burn or contribute to formation of
- smoke, gases, fumes.** It confines burnouts, will not soften under heat.
- 4. Higher Thermal Conductivity.** Cables run cooler in Transite, reducing I²R losses, increasing current capacity and prolonging insulation life.
- 5. Easy to Install.** Transite Ducts are light weight, easy to handle. Joints are quickly made. Long 10-foot lengths reduce number of joints in line.



Johns-Manville TRANSITE® DUCTS

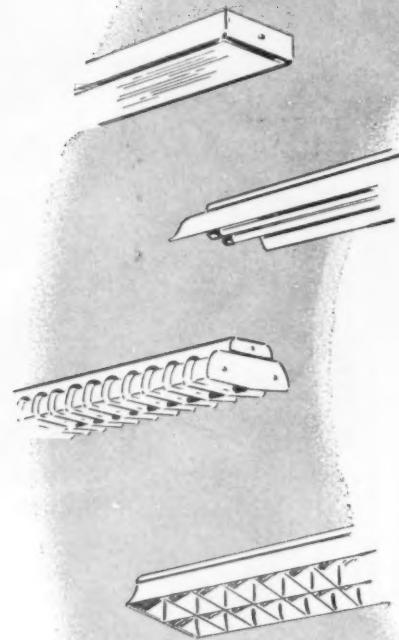
TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

whether you

MAKE
SPECIFY
DISTRIBUTE
INSTALL
OR USE

fluorescent fixtures



you'll get greater satisfaction
when they're equipped with

CERTIFIED  **BALLASTS**

because they're

"Tailored-to-the-Tube"

"Tailored to the Tube" truly describes CERTIFIED CBM BALLASTS. They are made to specifications that match the requirements of the fluorescent tube they operate.

Ballasts made to these exacting specifications, designated by Certified Ballast Manufacturers, assure

LONG LAMP LIFE

LONG BALLAST LIFE

FREEDOM FROM OVER-HEATING

QUIET, TROUBLE-FREE OPERATION

CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO



"Talk-Don't Walk"

MODERN BUILDING PLANS SPECIFY COMPLETE INTER-COM SYSTEMS

Good inter-com systems are just as accepted as a part of today's architecture as its modern design. Permanently built-in communication systems naturally include the long-life, trouble-free characteristics provided by Belden Inter-Com Cables.

There is a specialized Belden Cable for every inter-com or sound system requirement.

Belden Manufacturing Co.
4623-A W. Van Buren St.
Chicago 44, Ill.



For Permanent Installations
For Profitable Work

FOR EVERY TYPE OF INSTALLATION
FOR EVERY TYPE OF EQUIPMENT
BELDEN HAS THE CABLE BUILT TO
SPECIFICATIONS

Belden
Inter-com
CABLE



Cope Cable Trough installed at the Ford Motor Company, Dearborn, Mich.

COPE CABLE TROUGH—VERSATILE, INDEED!

The photograph above shows a run of Cope Cable Trough carrying not only power cables for the overhead electric welders, but tubing for the cooling water as well! It is an excellent example of the versatility of this method of power distribution.

The low cost and the ease with which Cope Cable Trough may be installed are making it extremely popular these days as a standard system for the support of power and control cables.

And that's not all . . . the trough is available in a wide range of sizes and fittings which permit it to be quickly set up at the job site to conform to almost any plant layout.

Why not find out more about Cope Cable Trough? Write today for further information . . . Ask for Bulletin 10-EC.

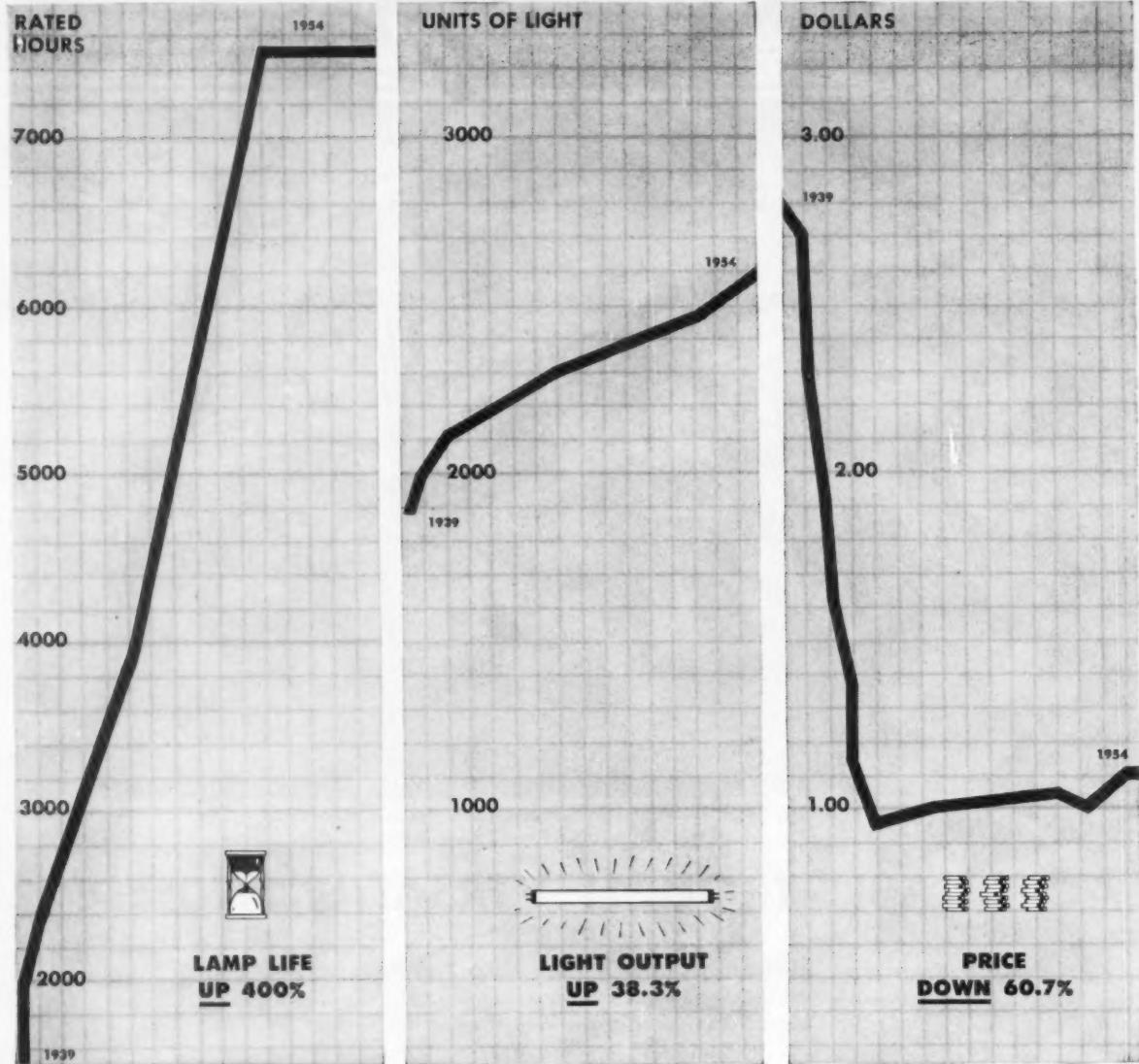
You know Cope by these products

T. J. COPE, INC.



711 SOUTH 50th ST., PHILADELPHIA 43, PA.

YOU EXPECT THE BEST VALUE FROM G-E FLUORESCENT LAMPS



**16 times more value for
your fluorescent lamp
dollar than in 1939**



Today you don't have to pay more than \$1.10 for the finest fluorescent lamp made: General Electric. Fifteen years ago it would have cost you \$2.80 or \$1.70 more. And while price has been going down, we've been pushing quality up. General Electric has upped light output 38%, increased lamp life 400%.

In terms of what you really judge lamps by, a General Electric 40-watt fluorescent lamp that lists at \$1.10, plus tax, today is a *16-times bigger value than it was in 1939*.

For further information, contact your G-E lamp supplier or write to Lamp Division, General Electric, Department 166-EC-10, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

How



Metalclad Switchgear

PAYS FOR ITSELF IN HALF THE TIME

at the University of Louisville

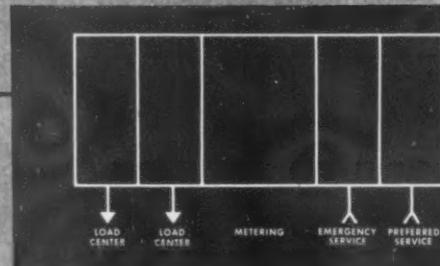
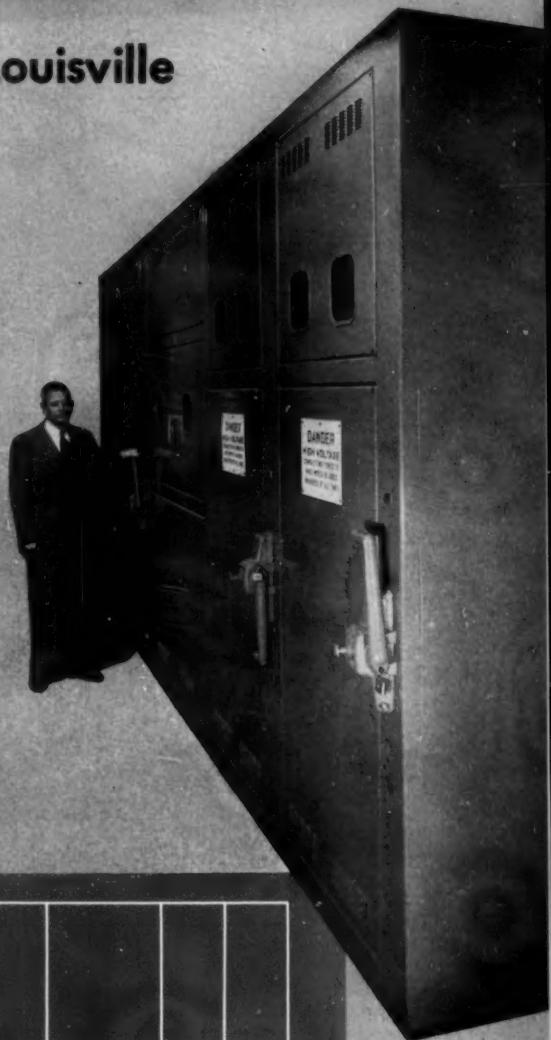
THE University of Louisville recently completed the initial phases of modernizing its electrical system. This program provided for replacing six 110/220-volt metering stations with a high-voltage switching center where the incoming service is metered at 13.5 kv. The University is now saving at the rate of several thousands of dollars annually in electric power costs—and as projected additional loads are added, the annual savings will be still further increased.

The low initial cost of S&C Metalclad Switchgear—used for this new switching center—makes it possible for these annual savings to pay for the switching center very quickly.

Don't let your plans for modernization or new construction crystallize without first finding out whether S&C Metalclad Switchgear can provide the protection and switching you need. Information about S&C Metalclad Switchgear is contained in this booklet . . . send for a free copy . . . yours for the asking.

Mr. R. S. PURVIS, Superintendent

of Buildings and
Grounds for the Uni-
versity, proposed
the modernization
of the University's
electrical system.
He said, "We chose
S&C Metalclad
Switchgear because
of its low initial
cost, its safety, and
the fact that it is
very easy to add to
when additional loads
require it."



THE UNIVERSITY OF LOUISVILLE

switching center provides (1) manual switching on preferred and emergency circuits, (2) metering of the 13.5 kv service, (3) protection and switching of feeders which supply outlying load centers from which 110/208-volt lighting and power service is provided to surrounding areas.



S&C Electric Company
4433 Ravenswood Ave., Chicago 40, Illinois

Please send me your new booklet on S&C Metalclad Switchgear. No obligation on my part, of course.

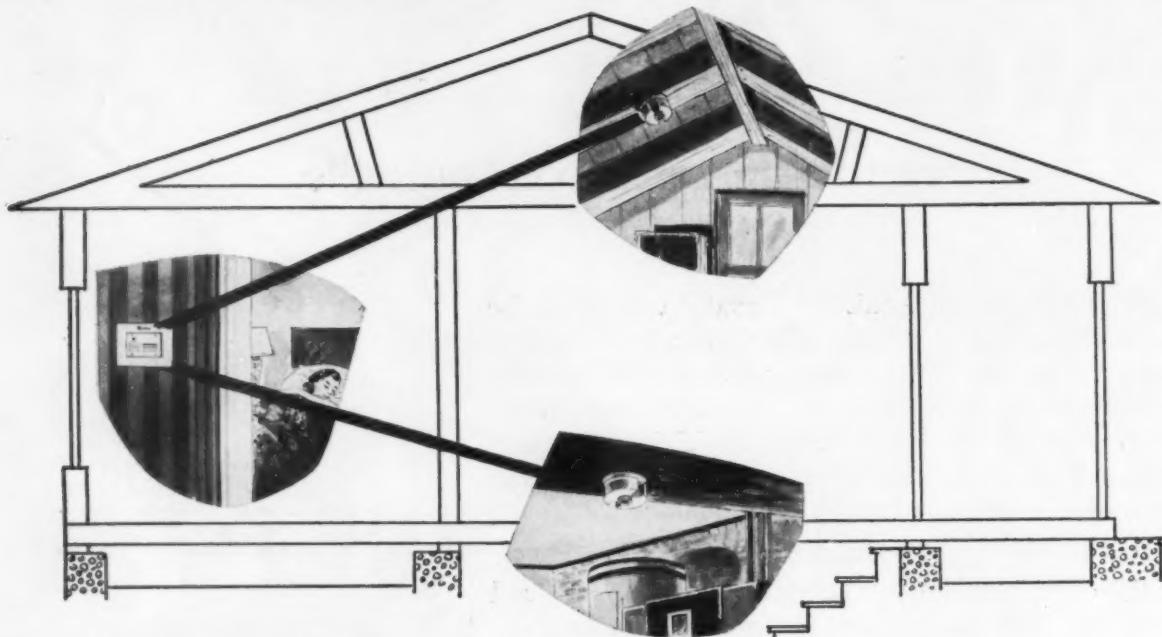
Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Terrific new chance for extra profits...



EVERYBODY'S a prospect for the NEW EDWARDS HOME FIRE ALARM!

Here's one product everybody you deal with should have — the new Edwards home fire warning system. Why? Because it offers something everybody wants and needs — *permanent fire protection*. Remember — over 300,000 homes had fires last year. 5,000 people died from home fires — over a thousand, children under five years old. Point out these facts to your prospects. Tell them that in most fires it's the first five minutes that count — that the Edwards Home Fire Alarm can save a life, a home.

Show your customers how the Home Fire Alarm works. Just hold a match under one of the two detectors on the display . . . hear the loud clear alarm sound off. Show them how they can test the system any time by just pressing the test button. Explain that you install the detectors in furnace area and attic. That they sound the alarm when the temperature rises above 140°F. . . . UL approval means they are sure to work. Show your customers how the system uses low cost, quickly installed bell wire . . . that it's fool proof, automatic, never needs servicing or adjusting.

Here is the hottest new salesgetter in the residential field. Cash in . . . now!

FREE! Ad mats, catalog pages, envelope stuffers! Write Edwards Company, Dept. ECM-10

EDWARDS NORWALK, CONNECTICUT
IN CANADA, OWEN SOUND, ONT.



First choice for 50 years

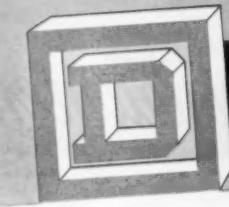
**SQUARE D
SAFETY
SWITCHES**



*COMPARE...LINE for LINE and FEATURE for FEATURE
THEY COST NO MORE...WHY SETTLE FOR LESS?*

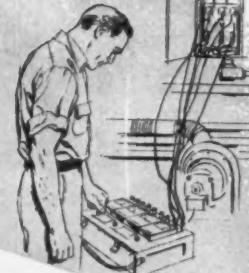
ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY



tools that

Streamline electrical maintenance



FOR POWER PROBLEMS...



FOR MOTORIZED
EQUIPMENT...



FOR ELECTRONIC
TROUBLE SHOOTING...



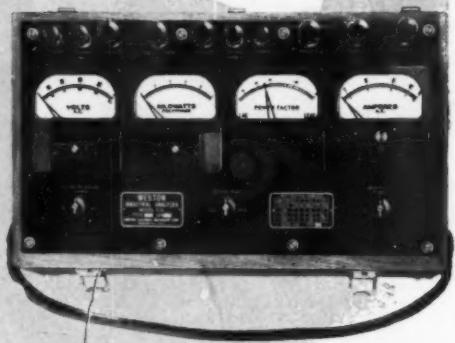
WESTON INDUSTRIAL CIRCUIT TESTER
(Model 785) the versatile 28 range
super-sensitive portable tester.

Especially designed for checking electronic control and power equipment. Seven d-c voltage ranges: .1 to 1000 (20,000 ohms per volt) . . . six a-c voltage ranges: 5 to 750 (1000 ohms per volt) . . . six d-c current ranges: 50 microamperes to 10 amperes . . . four a-c current ranges: .5 to 10 amperes . . . five resistance ranges: 3000 ohms to 30 megohms . . . all ranges full scale . . . a-c and d-c current ranges extended with external transformer or shunts. New temperature compensated rectifier circuit gives greater a-c accuracy.



WESTON CLAMP VOLT-AMMETER
(Model 633) measures current and
voltage without breaking circuits
and disrupting operations.

Combines in one instrument five full-scale a-c current ranges of 1000/250/100/25/10 amperes with range overlap for good readability . . . three self-contained a-c voltage ranges of 700/350/175 volts, with instrument insulated for 750 volt service. Has convenient 6-position thumb switch for range selection, and adjustable pointer stop for measuring motor starting current.



WESTON A-C INDUSTRIAL ANALYZER
(Model 639) a combined Voltmeter,
Wattmeter, Power Factor Meter, Am-
meter . . . all interconnections made!

A real timesaver because only one hook-up is necessary to measure a-c current, voltage and power in single and polyphase circuits, as well as power factor in 3 phase, 3 wire, balanced circuits. Adequately insulated binding posts . . . high overload capacity. Furnished in compact oak carrying case measuring only 18 $\frac{1}{8}$ " x 10 $\frac{1}{8}$ " x 6 $\frac{1}{8}$ ".

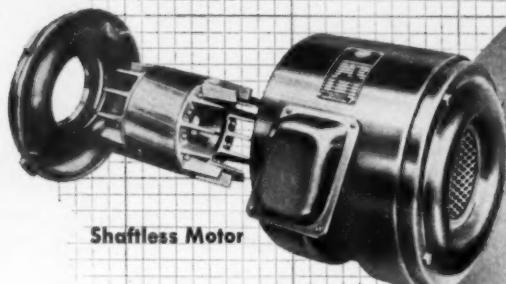
AVAILABLE
THROUGH LEADING
DISTRIBUTORS

WESTON *Instruments*

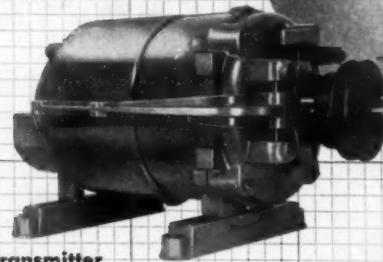
WESTON Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

a motor **designed**
for its job
will out-perform a "standard"

Special Purpose
Extended Bearing Motor

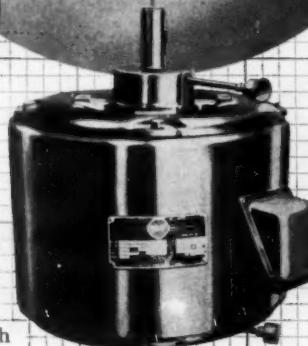
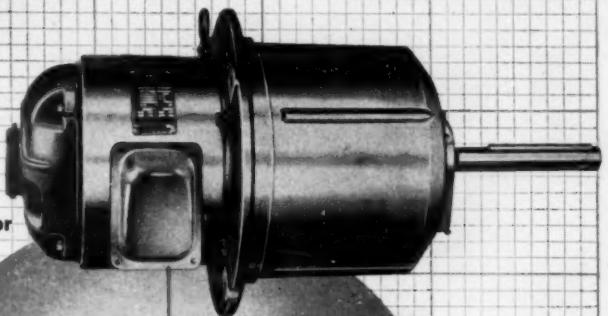


Shaftless Motor



Power Transmitter
(Clutch-Brake Motor)

Special Purpose
Vertical Motor



No standard motor can hope to match performance with a motor custom designed to meet unique requirements.

That's why Diehl lays so much emphasis on custom construction . . . why, through the years, it has geared its abilities and its facilities, its design, engineering and manufacturing functions for maximum cooperation with its customers . . . whatever the application.

DIEHL custom-tailored motors can:

Cut costs • Save space • Reduce weight • Improve safety
Simplify design • Speed production • Improve appearance

When you want a fast, thorough answer to an unusual motor problem it will pay you to consult Diehl. Name your conditions . . . Diehl will design and build to match.

DIEHL MANUFACTURING COMPANY
Electrical Division of THE SINGER MANUFACTURING COMPANY
Finderne Plant, SOMERVILLE, N. J.

Please send me the following bulletins:

- New Type "D" Motor Bulletin No. EC-3304
 Consolidated Catalog & Price List No. EC-3310

Name. _____

Company. _____

Street. _____

City. _____ State. _____

INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES



Hudson's Northland, a branch of the J. L. Hudson Co. department store in the heart of the new Northland regional shopping center, Detroit. Store fronts total one and a quarter miles. Architect: Victor Gruen & Associates, Detroit. Electrical Contractor: F. J. O'Toole Co., Detroit.

LOOK HOW MANY TYPES OF JOBS

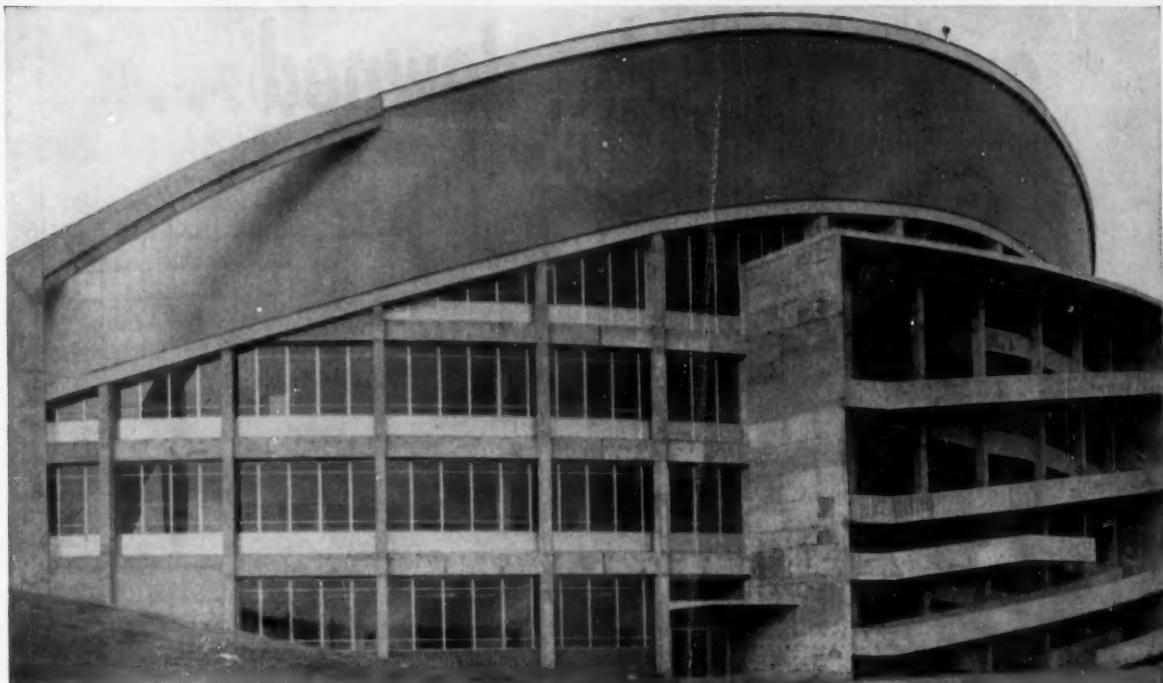


In schools like the Nerwood-Norfolk Junior-Senior High, Watertown, N. Y., wiring must be in dependable raceways. Republic "Inch-Marked" E.M.T. was used on the job. There's no threading, no need to cut the galvanizing or turn the whole runway to make tight joints. Architect: Sargent, Webster, Crenshaw & Folley, Syracuse, N. Y. Electrical Contractor: Shelly Electric, Inc., Potsdam, N. Y.

Contractors find they save with Republic "Inch-Marked" E.M.T. This store in Charleston, South Carolina, has wiring in Republic E.M.T. Electricians like it because they can make smooth, accurate bonds right on the job. Architect: Armistead & Saggus, Atlanta, Ga. Electrical Contractor: Whitehead Electric Co., Atlanta, Ga.

Contractors find Republic E.M.T. goes in easier. And electricians find wire-pulling is up to 30 per cent easier because of exclusive inside-knurling. This housing project has wiring in Republic E.M.T. Architect: Sargent, Webster, Crenshaw & Folley, Syracuse, N. Y. Electrical Contractor: Barber Electric Co., Inc., Watertown, N. Y.





The new State of Alabama Agricultural Coliseum is one of many special types of buildings being erected in many parts of the country. The problem here was floods and spotlights which were mounted on a catwalk 76 feet in the air. Architect: Sherlock, Smith & Adams, Montgomery, Ala. Electrical Contractors: T. D. Little Co., Montgomery, Ala.

ELECTRICAL CONTRACTORS SAVE ON WITH REPUBLIC ELECTRICAL METALLIC TUBING

In schools, hospitals, shopping centers, department stores, apartments, coliseums, housing projects, in fact in almost every type of building, you'll find Republic "Inch-Marked" Electrical Metallic Tubing.

Contractors like it because they find they can save. The "Inch-Marking" feature alone saves because it speeds accurate bending. Saves measuring, too. And using the Republic Calibrated Bender, it all adds up to a better job in less time. Electricians like it because they can make smooth, accurate bends and offsets. It's easier to install because it's designed that way.

No threading. No lines to turn. And exclusive inside-knurling makes wire-pulling up to 30 per cent easier.

Many contractors have been using Republic, the "Inch-Marked" E.M.T. for years. Why not try it on your next job? Ask your electrical supplier for Republic ELECTRUNITE E.M.T. and the Republic Calibrated Bender.

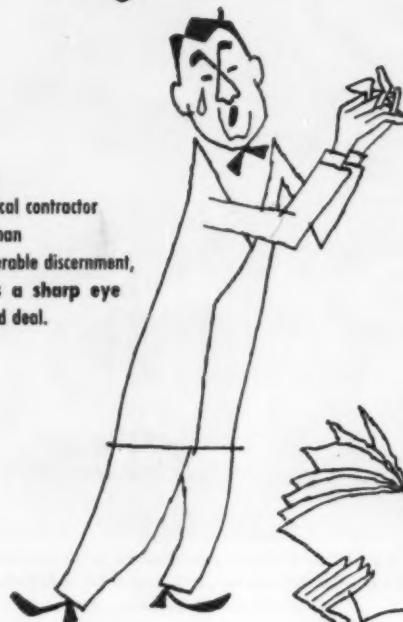
REPUBLIC STEEL CORPORATION
Steel and Tubes Division
212 E. 131st Street, Cleveland 8, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York



and the light dawned...



Jim Jones
... electrical contractor
... is a man
of considerable discernment,
and has a sharp eye
for a good deal.



He took great pride in his lighting jobs.
They weren't impressively large.
But they were well engineered
... efficient installations
that embraced the latest lighting practices.
And above all,
Jim had the satisfaction of having
initiated and sold the jobs.
How he yearned for an opportunity
to show them off.



P.S.

Jim found out that entering the Competition was a cinch. He's preparing his entry now. And rumor has it that he'll have several. Jim is confident that his entering the LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS is the brightest idea for building lighting sales since Tom Edison made his famous hair pin glow.

Then one day Jim read about the Light's Diamond Jubilee LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS to "provide wide industry recognition for sales initiative and application of modern lighting technology by electrical contractors."

Jim's interest was stimulated immediately by the 18 cash prizes (\$1350 in all).
But the money was a secondary consideration.
The real hook was having his entry published
in Electrical Construction and Maintenance
and receiving 1000 reprints of the published article for local sales promotion (if it won a first prize award). The recognition and business building possibilities
set him to thinking. "This Competition," thought Jim, "is the cat's meow! It's right up my alley."

So Jim used this coupon —
to send away for the official rules folder and some entry forms.

WHY DON'T YOU DO IT RIGHT NOW?



Lighting Competition Chairman
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd Street, New York 36, N.Y.

Dear Sir:

Please send me a copy of the Rules Brochure and _____ Entry Forms for
the Light's Diamond Jubilee LIGHTING COMPETITION FOR ELECTRICAL CONTRACTORS.

NAME _____

COMPANY _____ TITLE _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

ELECTRICAL
CONSTRUCTION
AND MAINTENANCE



A McGRAW-HILL PUBLICATION
330 WEST 42ND STREET, NEW YORK 36

25-year-old Manson tape exceeds ASTM specs

A railroad electrical engineer questioned us the other day in reference to the lasting quality of our Okonite and Manson Tapes. This recalled a letter we received a few years back



from a man who had bought a roll of Manson tape 25 years before. His letter said:

"There is not much left on this roll of Manson tape, but I have been pulling a little off this roll for 25 years... I have the original tin box and always keep the tape in it and the little bit that is left is still good." And he enclosed what was left of the tape.

We couldn't make all the ASTM tests because of the small amount left. But we made a tensile strength test and found that the sample tested about 25% above the ASTM minimum. *It also withstood the ASTM dielectric strength test of 1000 volts without breakdown.*

There are lots of case histories like this in our files. Remember, when you specify tape, you really want protection for the weakest part of the cable. Your best security is in the best tape.

Economy in tape is a long-range proposition. Okonite and Manson tapes will keep the splice tight and waterproof longer than ordinary tapes and consequently will help cut down high maintenance costs. It's "spliced for life" when you use Okonite premium quality tapes.

Why not send for a set of instruction sheets, EC-5678; you'll find them helpful.



...when you splice with:



AVAILABLE
THROUGH
AUTHORIZED
DISTRIBUTORS ONLY

Made by
THE OKONITE COMPANY
PASSAIC  NEW JERSEY
SINCE 1878

SPECIALISTS IN ELECTRICAL WIRES, CABLES AND SPLICING MATERIALS FOR 75 YEARS



How 55 Miles safe lighting at



500,000 CM stranded, single-conductor RoMarine-RoPrene cable used for underground power distribution. Heat- and moisture-resistant insulation and oil-resistant sheath help to assure dependability.

Single conductor RoMarine-RoPrene lighting cable rated at 3,000 volts, being pulled underground at Ft. Worth, Texas, International Airport. Some 55 miles of this and other Rome Cable constructions were used in this installation.

Installation: Ft. Worth International Airport, Ft. Worth, Texas
Electrical Contractor: Fagan Electric Co., Inc., Little Rock, Pine Bluff, El Dorado, Arkansas



of Rome cables help assure Ft. Worth International Airport



Ft. Worth International Airport is one of the newest and most modern in the nation.

Virtually everything that can be done, has been done to make it safe for night flying.

To attain safe lighting, Rome cables were used to deliver the power to 452 special lights along runways and taxiways.

Huge installation

This cable installation represents some $7\frac{1}{2}$ tons of copper drawn and stranded into several different diameters; about $10\frac{1}{2}$ tons of specially compounded rubber and $9\frac{1}{2}$ tons of specially compounded RoPrene (Neoprene) sheath.

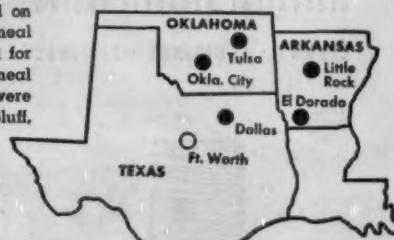
RoMarine-RoPrene—the superior airport lighting cable

Much of this cable is famous RoMarine-RoPrene lighting cable, the first to be approved under CAA specification L-824. It offers RoMarine (specially compounded heat and moisture-resistant rubber) insulation and RoPrene (Neoprene compound) all-resistant jacket which permits direct burial in earth. This construction also enables you to make simple manual connections, eliminating need for potheads and stress cones.

To get further information on RoMarine-RoPrene and other outstanding Rome Cable constructions, send for copy of "Minimizing Failures in Airport Lighting Cable," and the Power and Control Cable Catalog. Just mail the coupon.

Rome cables also used for other southwestern airports

In addition to Ft. Worth, Rome cables were used in the airports indicated on the map (right). A total of 391,000 lineal feet of RoMarine-RoPrene was used for these airports besides the 210,000 lineal feet for Ft. Worth. All installations were made by Fagan Electric Co., Pine Bluff, Little Rock, El Dorado, Arkansas.



It Costs Less to Buy the Best



ROME CABLE
Corporation
ROME • NEW YORK
and
TORRANCE • CALIFORNIA

ROME CABLE CORPORATION, Dept. EC-10, Rome, N. Y.
Please send me a copy of "Minimizing Failures in Airport Lighting Cables" and the Rome Power and Control Cable Catalog.

Name.....

Company.....

Address.....

City..... Zone..... State.....



PITTSBURGH STANDARD
the only
**GALVANIZED
THREADS
ON HOT-DIP
GALVANIZED CONDUIT**

say goodbye

TO THREAD RUSTING WORRIES

Here's goodbye to the rusting of threads on hot-dip galvanized conduit...goodbye to rusting in storage...goodbye to time and money-consuming thread-cleaning on the job.

Hot-dip galvanized conduit with galvanized threads is the first bonus for you from the extraordinary new Pittsburgh Standard Morrisville Plant*—the world's most modern conduit mill.

Only Pittsburgh Standard offers this major bonus to you—and at no increase in price. Here's another reason why Pittsburgh Standard Hot-Dip Galvanized Conduit is "Standard of the Trade."

*Galvanized threads on all sizes from Morrisville, and on sizes 2½-in. and larger from Etna.

**PITTSBURGH
STANDARD
CONDUIT CO.**

61 BRIDGE ST.

PITTSBURGH 23, PA.

PLANTS AT MORRISVILLE & ETNA, PA.

WHOLESALERS IN PRINCIPAL CITIES

Need immediate information on which to base bidding estimates and work schedules? Ask your Pittsburgh Standard agent. The unique Pittsburgh Standard Sales Control Center will enable him to give you immediate facts. Guesswork is eliminated and you're days and dollars ahead.

Washington Report

Politics, and speculation on election results next month, currently account for and influence most news coming out of Washington. The outcome will influence business decisions. It will also affect future Government programs, activities and policy. It is of first importance to Government officials and Administration policy makers.

Federal spending plans for 1954/55 fiscal year have been revised downward from President Eisenhower's budget request of last January, from \$65.6 to \$64.0 billion, or \$1.6 billion less. But civilian outlay will be up about \$1.4 billion higher than originally planned, Budget Bureau announced recently. The big drop will be in defense spending, down from last fiscal year's \$40.1 billion to \$35.5 billion this year. Revised revenue estimates indicate income will slide \$5.3 billion from last year to \$59.3 billion. The increase in civilian outlays, Budget Bureau reports, will be for Administration programs such as housing, shipbuilding, veterans' benefits, public health and rehabilitation, highway building, and farm price supports.

Electrical equipment and supplies wholesalers in 1953 totaled 2,899, and their sales were \$3,194,000,000, Bureau of Census and Department of Commerce jointly reported in August. This compared with 2,667 establishments in 1948, with total sales of \$2,373,000,000. This "Annual Wholesale Trade Report—1953" was result of "spot check" of business in lieu of complete Census of Businesses scheduled for 1953 but dropped for economy reasons.

Home owners' repair outlays for the first five months of 1954 were about \$3 billion, according to a special survey by the Census Bureau. About \$1.4 billion was for alterations and improvements, \$1.3 billion for repairs and replacements, while roughly \$331 million went for additions to homes, Census reported.

New construction activity maintains growth rate and sets new record month after month. As major factor in electrical construction market, it provides continued optimistic business outlook for electrical contractors, and a healthy prop to the economy. As BLS points out, in report on August construction, private funds are major factor in expanding growth.

Construction outlays in August were \$3,605 million, up 3% over July, 8% over August 1953. Monthly average in 1946 was \$1 billion. First 8 months total was 5% higher than 1953's similar period. Private funds accounted for \$2,436 million of the August total, up 10% from a year earlier, with public funds covering \$1,169 million outlay, up 4% over August 1953.

New home building really got rolling this summer, with August estimated volume at \$1,140 million, up 15% over August 1953. Number of starts was reported at 111,000 down 1,000 from July, but 17,800 above August a year earlier. Private funds accounted for 109,800 of the starts, compared with 1,200 starts with public money. Starts for first 8 months were 780,500 private and 15,500 public. Starts for similar period in 1953 were 741,700 private, and 29,600 public.

Record homebuilding year was 1950, with 1,396,000 starts for the year. Government statisticians report that if private homebuilding maintains its pace, starts this year will amount to 1,130,000, for the second best year in housing history.

Easier money terms under the new FHA housing law, and the fact people are no longer fearful of a depression, are credited with the rapidfire pace of home building.

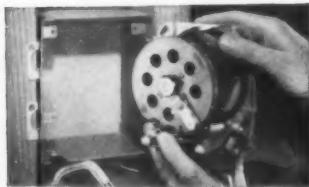
NEW

LUXTROL

LIGHT CONTROL



easy to install as an ordinary wall switch!



Here's really big news in modern home lighting. New LUXTROL Light Control gives at the touch of a dial any level of light from complete darkness to full brightness!

Yet LUXTROL is as easy to install as an ordinary wall-switch — which it replaces! In fact, you install it in exactly the same way:

You lay out your wiring according to specification. You attach the box to either the vertical or horizontal studs (it comes with mounting ears on all four sides). And after the plasterer has been around, you place the control in the box, wire, and put on the face plate. What could be easier?

Another thing — once LUXTROL is in, you can forget it. No service problems. No maintenance. Because LUXTROL is built by a leading producer of light control systems.

You'll soon be getting calls for this entirely new *kind* of modern light control. So why not arrange a personal demonstration right now. Just call Western Union Operator 25 in your own city and ask for the name of your LUXTROL distributor.

For full technical data on LUXTROL Light Control, write your name and address on a corner of this page, tear off and mail to The Superior Electric Company, 6104 Demers Avenue, Bristol, Connecticut.

Entirely new concept



in illumination



puts at your fingertips



any level of light



from complete darkness



to full brightness!



OCTOBER . . . at a Glance

OPERATION HELPING HAND—

Two tropical hurricanes hit New England last month tearing down power lines and leaving a trail of death and disaster. High tides propelled by powerful winds followed up with extensive flood damage to sea-coast cities. Restoration of power and light to the stricken areas was an immense emergency job which called upon the combined resources of utilities and electrical contractors from hundreds of miles inland.

Within minutes after the call for help went out, electrical contractors put fully equipped trucks and skilled men on the road, some with police escort, heading for a task of hard and often dangerous work around the clock. The prompt and willing response of dozens of individual firms and their quick integration into one vast and efficient combined operation to restore electric service to the public is a phenomenon without counterpart in industry.

Some idea of the scope of the task can be gathered from preliminary statistics. About two million people were left without electric service. Nearly 3,000 skilled electricians and linemen were rushed into the area from far off towns and cities inland to augment the efforts of local utility and contractor crews.

For a quick focus on the job, Industrial Editor Hugh P. Scott toured the Boston area contacting crews, contrac-

tors, motor shops and Boston Edison Company executives. He caught many of the highlights of the damage and the organization of the restoration crews, typical of the work that was going on simultaneously from Long Island to Maine. His report, mostly pictorial, was rushed to completion to beat the deadline for this issue. It begins on page 86.

ELECTRIC CEILINGS—Until very recent times it has always been easy to distinguish the lighting fixture from the ceiling. Fixtures were hung, attached or built into a structural component called the finished ceiling. But life and lighting have a way of confounding such convenient distinctions and it looks like the simple, inert, overhead boundary plane is turning into a functional electrical device devoted to the cause of environment engineering.

The blame, if that's the word, for this state of affairs rests mostly with those lighting people who insist that we have plenty of footcandles, but comfortably and efficiently, with low brightness. Consequently, they have occupied persistently larger fractions of the ceiling area with more and larger lighting equipments. In due course on some jobs they have claimed all of it.

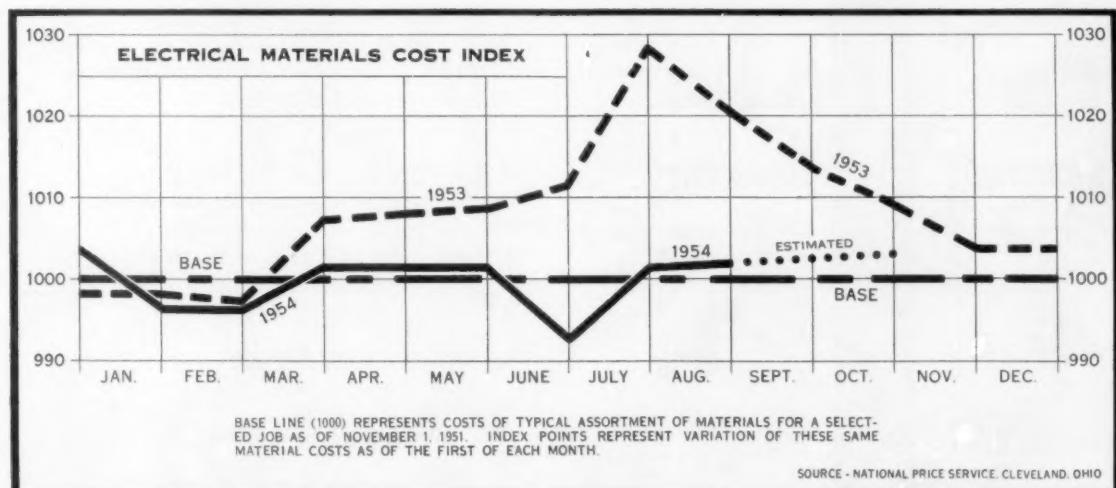
Now we have the electric ceiling, a ceiling in depth; its function as a space boundary quite secondary and often

illusory. It is a source of light, of heating and cooling, of ventilation, of sound control. It supports and houses paging and communication systems. It masks structural features and pipe services but leaves them fully accessible.

All of this, of course, is not for free. The electric ceiling is an advanced development offering superior facilities for environment control. Consequently, it requires considerably higher ratios of electrical work to building cost. But, paradoxically, in many remodeling and modernization jobs the electric ceiling has proved to be not only a very practical but a very economical solution to the ceiling problem.

Acknowledging the current importance of the electric ceiling in carving out new frontiers for electrical construction, Berlon C. Cooper has devoted his annual lighting report in this issue to the design and installation of electric ceilings. We believe this report constitutes the most comprehensive treatment of the subject in print.

For those who might be hesitant about pioneering in this vast and largely unexplored opportunity we commend the remark of a union business agent acquaintance who was admiring an unobstructed half-acre expanse of modular glowing plastic on metal rails overhead, "Look at all that new electrical work!"



ANACONDA DURALL-T

is fully approved* as

underground feeder (Type UF)

*by Underwriters' Laboratories, Inc.



HOMES



FARMS



INDUSTRIAL
PLANTS



CONCRETE
WALLS



HOOTHUSES



MINES

Bury it in the ground — and be *sure* of lasting service. Rugged jacket and insulation — both of ANACONDA Densheath** thermoplastic — resist moisture, soil acids, and crushing.

DURALL-T† is ideal, too — as type NMC — for cow barns, hothouses, concrete and cinder block walls, industrial plants, mines . . . and other places where heat, moisture, corrosive fumes and fungi lick ordinary nonmetallic-sheathed cable.

Get this tough new cable from your Anaconda Representative or Distributor. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*Reg. U. S. Pat. Off. †Trade Mark 54443

the right cable for the job

ANACONDA®

WIRE AND CABLE

Light's Diamond Jubilee

"Light for Freedom—Power for Progress." These words are heard often this year and especially this month as we celebrate the 75th anniversary of the incandescent lamp—the "hot hairpin in a bulb"—that was destined to change the ways of a world. But they bear repeating, because they speak not so much of current achievement as of hope for the future.

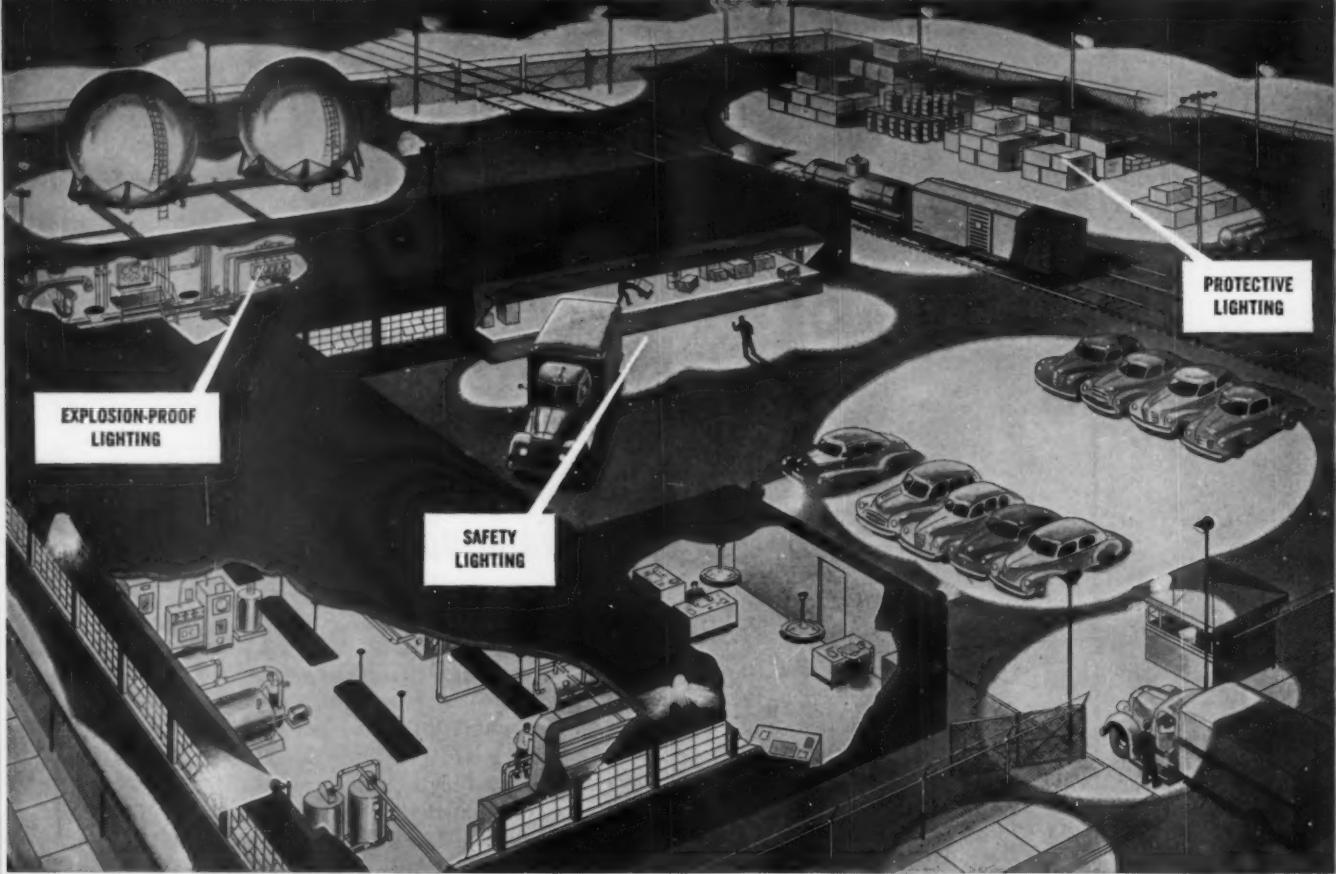
Incandescent electric lighting occupies only a small segment of history. The full development has occurred entirely within the life span of many men still active in the electrical industry. From the first few dimly glowing bulbs to vast electric ceilings measurable in acres is a miracle of progress in applied science. But the miracle is hardly noticeable because so many of us are involved, in one way or another, in the everyday achievements which contribute to the whole miraculous process.

For all our progress, and it is very great progress indeed, who among us would be willing to say, of even our most advanced work, that here is the optimum in lighting beyond which there is opportunity only for refinement of method, efficiency or control? The dynamics of lighting progress are such that the best of current practice is only a momentary reference point, from which further progress will certainly be measured.

To appraise "Light for Freedom—Power for Progress" only in terms of the most advanced examples of current achievement would be to miss the full significance of the challenge. There is, and always must be in a growth industry, some margin between conventional lighting practice and the notable top jobs that make headlines. The practical challenge which the electrical industry faces today, on this 75th anniversary of light, is the widening gap between the lighting most people live with and the superior lighting we know how to provide.

As we do honor to Thomas A. Edison for his great inventive genius and as we note spectacular progress in the science of applied light in its Diamond Jubilee year, it is also a good time to give some thought to the people in many factories, offices, stores, schools and homes who still share too little of the benefits of modern lighting technology. The challenge of "Light for Freedom—Power for Progress" is not only for those on the scientific frontier. It must be accepted too by the rank and file of practical electrical men who bear ultimately the responsibility for supporting the dynamic growth of the lighting industry.

Wm. T. Stuart



PUT GRAYBAR'S LIGHTING EXPERIENCE TO WORK FOR YOU

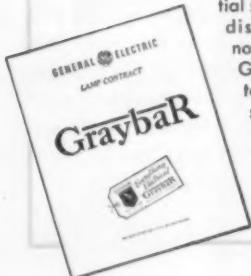
You can count on Graybar for accurate, helpful information on any of these typical lighting installations. We'll be glad to work with you in planning practical solutions

to the more specialized applications of protective lighting, safety lighting, and explosion-proof lighting. The fixtures and wiring materials they require can be conveniently secured through your near-by Graybar office.

How to simplify complex lighting jobs

SAVE on relamping costs with a Graybar Lamp contract

By placing all of your lamp purchases under this annual Graybar contract you can often make substantial savings over standard discounts. You invest nothing, and your local Graybar office will see to it that the types and sizes of G-Elamps you need are always in stock. Ask for complete information, today!



When the job's a tough one, call in your local Graybar Lighting Specialist. He's ready to help you and your customers develop tailor-made layouts for all types of protective or explosion-proof lighting installations.

But, no matter what the job—when it first comes up—that's the time to contact your Graybar Representative. Let him furnish the delivery, price, and specification data you need to make your bid. You'll get it fast, too, because Graybar people have this sort of information right at their fingertips. Later on, it's a simple matter to write out a single order for all the lamps, fixtures, wire, and fittings you need—saves you dollars both in time and paper work.

Remember, Graybar distributes over 100,000 different electrical items, including the most complete selection of lighting units and lamps available anywhere.

In fact, it pays to check with your local Graybar house for *everything electrical*—for wiring, power, ventilation, and communication, as well as lighting.

458-410

CALL GRAYBAR FIRST FOR...

Graybar

ELECTRIC CO., INC.
420 Lexington Avenue, New York 17, N. Y.



IN OVER 110 PRINCIPAL CITIES

BUILT-IN LIGHTING

and Planned Environments

Today's lighting application techniques reflect a growing acceptance of built-in types of lighting design and the need for intelligent integration of various modular design elements for desired environmental control.

TRANS-LIGHTED CEILINGS

RECESSED LIGHTING UNITS

LUMINOUS ENVIRONMENT

SOUND AND HEAT CONTROL

THE STANDARD of living in America is the highest in the world. Contributing heavily to this standard are planned environments, including luminous, acoustical, thermal, safety and others. In all these, human comfort and general well being are major objectives. Yet, notwithstanding all this, we are still not making full use of our technological knowledge and skills in these fields.

Not too long ago a building was little more than an enclosure of space to shut out the weather and provide privacy for the occupants. Design was limited primarily to the exterior. Lighting was at a minimum. Heating and cooling was by rule of thumb—sometimes comfortable, more often unsatisfactory. The occupants had to adjust themselves to this condition and make the most of it.

Today, this is all changed. Today, vast strides have been made—by architects, by scientists, by industry. Today, we know more about people, their habits, their wants, and their desires. We know more about the kinds of environment people need in order to carry on their daily activities most effectively.

Today we have new materials, new devices. We know how to plan better living and improved working environments. We now have the skill to design and equip today's buildings for maximum potential usefulness. We not only have the scientific and technical knowhow, but also desirable esthetic design ability.

Foremost in environmental engineering is lighting. Our knowledge of environmental lighting far exceeds our accomplishments. Built-in lighting implements and conforms with good environmental design concepts. It provides the tools necessary for creating an ideal luminous environment. And it offers a medium for creation of modular lighting elements, which can be integrated with modular elements for the control of sound, air conditioning, heating, fire protection and similar services. Such modular elements can be combined to form what is conceived as an *electric ceiling*, which would provide the visual and human comforts inherent in planned environments. This type of ceiling, built-in lighting techniques now in use, and planned environments are all discussed on the following pages.

Trans-Lighted Ceilings

The continuing struggle for an ideal artificial lighting system has spearheaded the development of today's modern louverall and translucent ceiling lighting systems.

TRANS-LIGHTED ceilings are symbolic of today's built-in lighting techniques and current lighting progress. They typify the best current practices in the production and refinement of interior lighting, and in its harmonious combination with modern architecture and new building structures. Their acceptance by specifiers and users has been slow, but has grown steadily since their first post-war commercial introduction about 1946.

Trans-lighted ceilings are simple in principle. They consist of a system of light sources concealed in a ceiling cavity above a suspended ceiling of shielding or diffusing media. Fluorescent lamps are used principally as the light source, and are supported on simple wiring strip, or in channel lamp housings in the more elaborate systems. Ceiling cavities are normally finished in a high reflectance flat white, or reflectors are used with the lamps to provide as high an efficiency as possible. Shielding of light sources is provided by a system of louvers, installed to form the suspended ceiling; or, by a system of glass panels or plastic sections which also provide added light diffusion. When louver shielding only is used, the system is referred to as a *louverall* ceiling lighting system. When glass or plastic diffusing media is used to form the suspended ceiling, it is generally referred to as a *luminous* ceiling lighting system.

The principle of the trans-lighted ceiling is not new. But the materials and types of equipment in use today for this type of lighting are new, application has reached an advanced stage of development, and installation techniques are greatly improved.

Trans-lighted ceilings of the luminous ceiling type were in use even before the invention of the electric lamp. They were used principally as one means for day-lighting large public areas, such as hotel lobbies, art museums, court rooms, and similar interiors. The light source was daylight, which filtered through a weatherproof natural skylight first, then through a second translucent ceiling suspended below the natural skylight. These suspended secondary ceilings were formed of diffusing glass, and often contained small panels of colored glass worked into an artistic design pattern. As the incandescent lamp developed into a practical

light source, it was used with suitable reflectors above these glass panel ceilings, to provide artificial light when daylight failed. Thus earlier luminous ceilings were logically referred to as "artificial skylights".

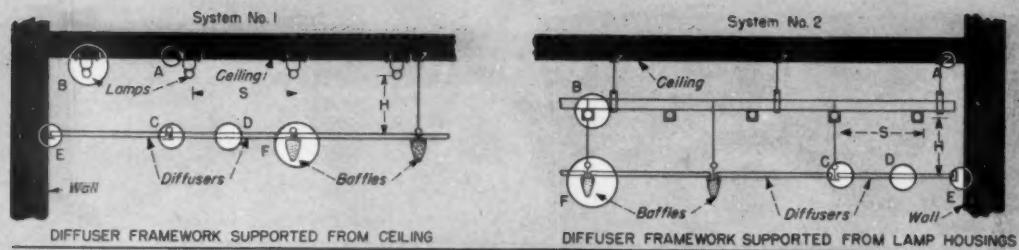
The announcement of the fluorescent lamp with its higher efficiency, today's lower cost of electrical energy, the availability of modern materials for shielding and diffusion of the light, and cleaner interiors resulting from the expanded use of air conditioning, have all contributed to the practicability of the modern trans-lighted ceiling built-in lighting systems. Their development at the termination of World War II was therefore perhaps a normal event.

Trans-lighted Ceiling Support Methods

Two basic methods are used for supporting trans-lighted ceilings. In one method, the true ceiling is used to support both the fluorescent lighting strip and the suspended louver or translucent ceiling, each being supported separately and independently of the other. In the other method, the true ceiling is used to support the lamp channel housings which in turn support the suspended ceiling.

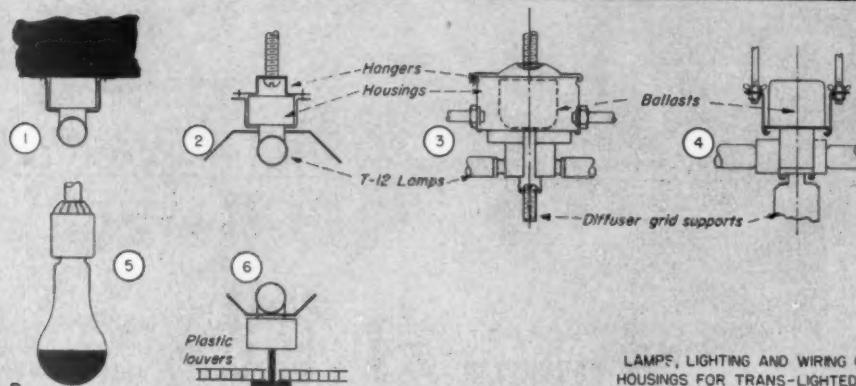
From the standpoint of the electrical contractor and the electrical industry, the method of support is most important. When the suspended ceiling is supported directly from the true ceiling, its installation may sometimes be interpreted as coming under the jurisdiction of some other craft than the electrical contractor. Such interpretation may limit the electrical contractor's scope of work to the installation of the wiring channel only. In such instances the electrical contractor may be required to sublet the installation of the suspended ceiling, even though it is specified in the electrical contract and the entire supporting grid framework, louvers, and diffusers are purchased and supplied by him.

On the other hand, if the suspended ceiling is supported by the lamp channel housings, then the furnishing and installation of the entire system is generally interpreted as being under the full jurisdiction of the electrical contractor. It is then furnished and installed complete by the electrical contractor.



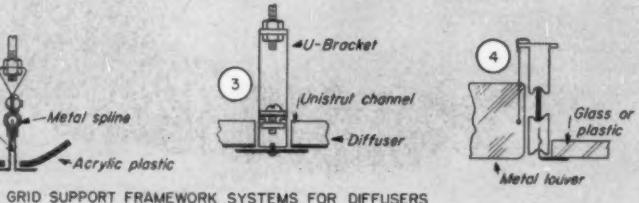
Detail A

CEILING SUPPORT BRACKETS



LAMPS, LIGHTING AND WIRING CHANNEL HOUSINGS FOR TRANS-LIGHTED CEILINGS

Detail B



Detail C

GRID SUPPORT FRAMEWORK SYSTEMS FOR DIFFUSERS

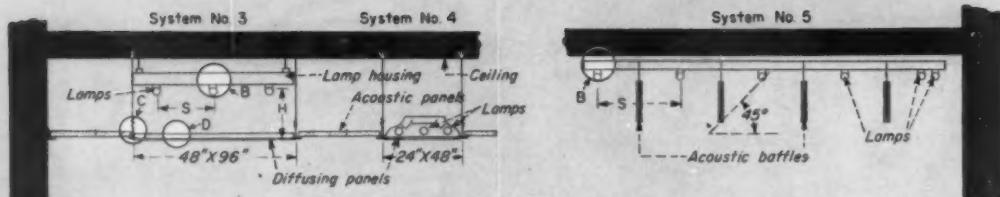
This is the very essence of the full concept of the *electric ceiling*. Such a ceiling is conceived as one which houses and supports all electrical devices, including lighting, PA speakers, etc., as well as acoustical materials, sprinkler heads, air diffuser outlets and other mechanical devices and services. These ceilings also serve as an enclosure for the room, and conceal all pipes, duct work, conduits, beams, etc., normally located in this ceiling plenum. Advantages in the use of such ceilings will be readily apparent to all segments of the electrical industry.

Louverall Ceilings

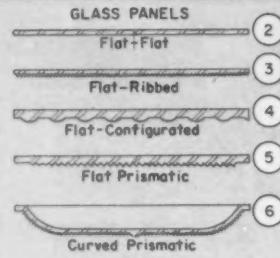
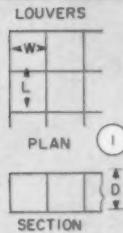
Wall-to-wall ceilings formed of louver panel sections were first offered commercially about 1946. Quickly the idea spread, and practically every conceivable type, size, shape and finish of louver was used subsequently, varying

from one installation to another. Many manufacturers devoted much time and research to the problems of cavity finish, use of reflectors of varying light distribution versus bare lamps, size of louver cells, degree of shielding needed, finish of louvers, methods of support, acoustical properties, interference to operation of sprinkler systems, etc. Out of this research and the experience of actual installations came much valuable information. The variety of the materials, finishes, cell pattern shapes and sizes which have finally evolved as standard are shown in Table I. Average coefficients of utilization are given in Table II for the more popular types of trans-lighted ceilings.

Most louverall lighting manufacturers have standardized on 45-degree shielding, and square, or "eggcrate" cell pattern design. These cells vary in size generally from 1- by 1- by 1-in to 3- by 3- by 3-in, with the 2- by 2- by 2-in



LARGE-AREA LOW-BRIGHTNESS CEILING PANELS



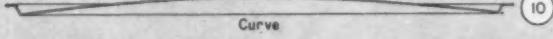
GRID LIGHT AND SOUND SYSTEM

PLASTIC DIFFUSERS

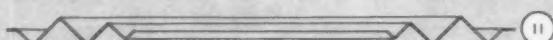
Flat Translucent Panels



MOULDED FORMS



Curve



Zee



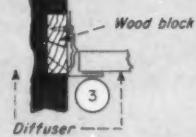
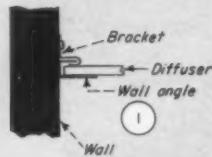
Pyramid



13

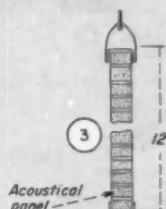
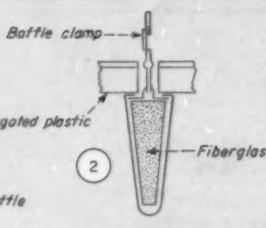
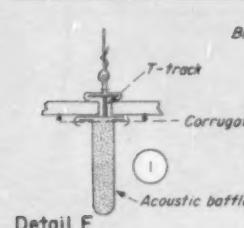
Detail D

LOUVER SHIELDING AND DIFFUSER ELEMENTS



Detail E

DIFFUSER SUPPORTS AT WALL



Detail F

ACOUSTICAL BAFFLES AND LIGHT SHIELDS

size being the one most generally available. Recently smaller cell patterns have been announced, and are finding acceptance for certain types of installations.

Louvered lighting has many inherent advantages, also some disadvantages. Louvers permit a wide range of brightness control of the luminous ceiling plane which they form. This is accomplished by varying the louver finish. The system permits a wide range of lighting intensities, and different spectral qualities of the resulting illumination, through the use of multiple switching and different color quality lamps on different circuits. It also permits full flexibility of design effects, depending on the imagination and ingenuity of the lighting designer.

The louvered system may be designed with a standard cell pattern extending from wall to wall, or with all louvers in the same finish for a uniform overall effect. Or, cell patterns may be varied in different panel sections, to provide a pattern design in the ceiling. Likewise, finishes

on louvers may be varied in different panels, or even different colors may be used for different louver panels, to form an overall ceiling pattern. When desirable, incandescent spotlights may also be mounted in the plenum area and their concentrated beams directed downward through louver sections to highlight specific areas in the room below.

Early installations of louvered ceilings were more or less experimental. In many of these the louver blades were soon bent, or knocked out of line, and the panel sections did not line up accurately in their supporting framework. This resulted in unsightly appearance. Fortunately, most problems of this type have now been solved.

An inherent problem with the louvered principle of lighting is that the bare light sources in the plenum over the louver sections, while concealed in the direct glare zone, are still exposed to the work surfaces below through the louvers. Where specular or glossy surfaces exist, this

causes reflected glare, especially when the maintained lighting intensity is below 50 footcandles. This condition is improved by having all surfaces on the work plane finished mat, or by increasing lighting intensities to a level wherein the average reflected brightness approaches the brightness of the reflected bare lamp images.

Luminous Ceilings

Paralleling the development of louvered lighting, but at a slower pace, has been the development of the so-called luminous, or translucent ceiling lighting. It is simply the same translited ceiling except that the louvers are replaced with translucent diffusing sections of glass or plastic. The slower pace has been deliberate. Manufacturers faced many different problems, which they wanted to investigate thoroughly before proceeding with production. One of these was the problem of sag in large plastic panels. Another was the problem of weight when glass panels were used. And another was the problem of sound control, or acoustical treatment. Still another was fire protection, and another was maintenance. All of these and other problems were investigated and studied. Most of these problems have been satisfactorily appraised and solved. And now, with many lighting manufacturers accepting the principle of translucent ceiling lighting, the specifiers and buyers are accepting it and the demand for it is growing. This is causing more and more manufacturers to develop their own versions of trans-lighted ceilings, so that the trend to this type of built-in lighting is firmly entrenched in growth.

Trans-lighted ceiling lighting also has advantages and disadvantages. It has the flexibility of variable lighting intensities and of resulting lighting effects inherent in the louvered systems. Lighting intensities may be varied by varying the spacings and mounting heights of the lamps, and by providing for different lamp current operation of the lamps. Spectral quality of the resulting illumination may be varied by combining lamps of different color quality, or by painting the cavity surfaces in proper colors to implement the color of the fluorescent lamps being used, or by using a combination plastic filter-diffuser which has been announced recently. This new filter-diffuser may also be used as a diffuser panel section, or merely installed above other standard diffuser panels and used entirely as a color filter.

Two types of plastic are normally used for diffuser panels. One is vinyl, corrugated for stiffness but thin enough to be rolled up for handling. The other is acrylic, also corrugated for stiffness, although it is supplied in thicknesses adequate for maintaining considerable rigidity.

Acrylic plastic is also used for formed panels for luminous ceilings, and may be molded into any attractive form desired. These forms lend necessary rigidity, also create pleasing patterns.

Glass panels may be prismatic, or simple diffusing patterns, and supplied in suitable thickness, degrees of diffusion, and sizes.

Mounting methods now in use for supporting the translucent panels or louver sections vary greatly in design, construction, and method of support. Many lighting manufacturers make and supply their own grid frameworks, designed specifically for their own louvers or diffusers. There are also available a wide variety of T-bar and similar supporting frameworks, designed specifically for use with acoustical tile systems but easily adapted for use in trans-lighted ceiling installations. There is need for standardization in this field to provide for maximum flexibility in interchange of shielding and diffusing devices.

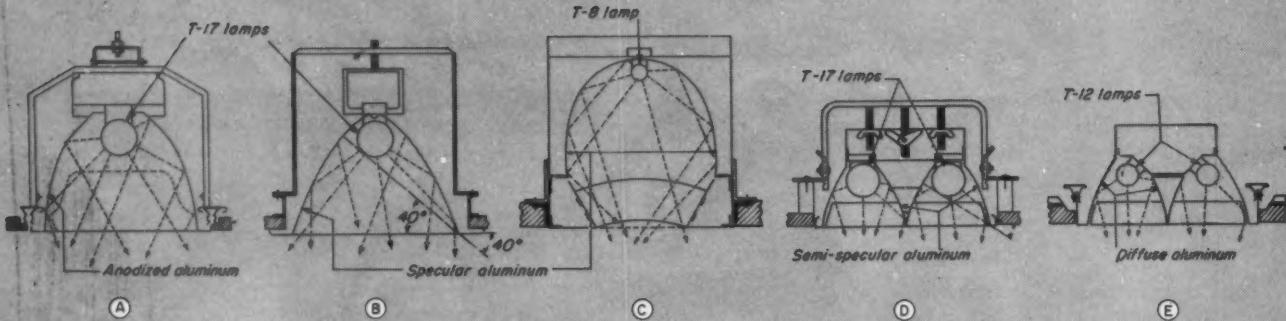
TABLE I. Louvers Vary In Size, Materials and Finish

Materials	Finish	Cell Patterns	Sizes
Aluminum	Etched to Specular	Square Rectangular Hexagonal	H = $\frac{1}{4}$ " to 6" W = $\frac{1}{2}$ " to 8" L = $\frac{1}{4}$ " to 10"
Steel	Diffuse to Gloss	Square Rectangular Hexagonal Sine Wave	H = $\frac{1}{2}$ " to 6" W = $\frac{1}{2}$ " to 8" L = $\frac{1}{2}$ " to 10"
Plastic	Diffuse	Rectangular	H = $\frac{3}{4}$ " to 2" W = $\frac{3}{8}$ " to 2" L = $\frac{3}{4}$ " to 2"
Wood	Diffuse to Gloss	Square Rectangular	H = 6" to 12" W = 6" to 16" L = 6" to 36"

TABLE II. Coefficients Of Utilization For Trans-Lighted Ceiling

Type of System	Type Ceiling	Room Index*	Wall RF-50% Cavity RF-75%
Wall-to-Wall (Systems 1 and 2)	Translucent Panels	B E H	.53 .47 .36
	Plastic Louvers	B E H	.48 .43 .37
	Metal Louvers	B E H	.41 .36 .30
Large-Area L-B Panels (System 3)	Translucent Panels	B E H	.48 .42 .35
	Translucent Panels	B E H	.58 .53 .45
	Acoustic or Plastic Baffles	B E H	.68 .57 .47
Modular Units (System 4)	Translucent Panels	B E H	
Grid Lighting (System 5)	Acoustic or Plastic Baffles	B E H	

*Find Room Index by referring to any Room Index table, which lists indices from A to J. Interpolate for CU Values for other indices. Also, see manufacturers' catalogs and literature for complete CU data on specific equipment.



LOW BRIGHTNESS TROFFERS

Built-In Lighting

Recessed Troffer

THE recessed troffer was one of the first types of lighting equipment to be developed for use with fluorescent lamps. It has many inherent advantages, and has now reached a fairly stable point of design standardization, but with a wide variety of designs available to provide for maximum flexibility in application and installation techniques.

The basic elements of a recessed troffer are a housing, wireway, reflector, shielding or diffusing devices, and the necessary fluorescent lamp components, such as ballast, lampholders, and starter switches and sockets for pre-heat type fluorescent lamps. Also available are a variety of suspension devices, supporting brackets, angles, etc., for mounting it in various types of building construction.

Most troffers are designed with an approximate 12-inch width, and in individual unit lengths of 48, 60, 72 and 96 inches, according to the lengths of the types of lamps for which they are designed. They are also designed for continuous row use. These dimensions permit these troffers to be recessed and supported in standard ceiling grid frameworks used for most standard 12-inch wide acoustical tile sections.

Fluorescent troffers are used principally for lighting offices, drafting rooms, conference rooms, banks, and similar locations where a high intensity of general lighting is desired. They can be installed in continuous rows to form lines of light, or in grid or geometric patterns. They are made in two basic types, one deep, and one shallow. The deep type troffers provide natural crosswise shielding of approximately 45 degrees normal to the troffer length, while shallow type troffers depend on louvers, lenses or diffusing materials for variable crosswise and lengthwise shielding.

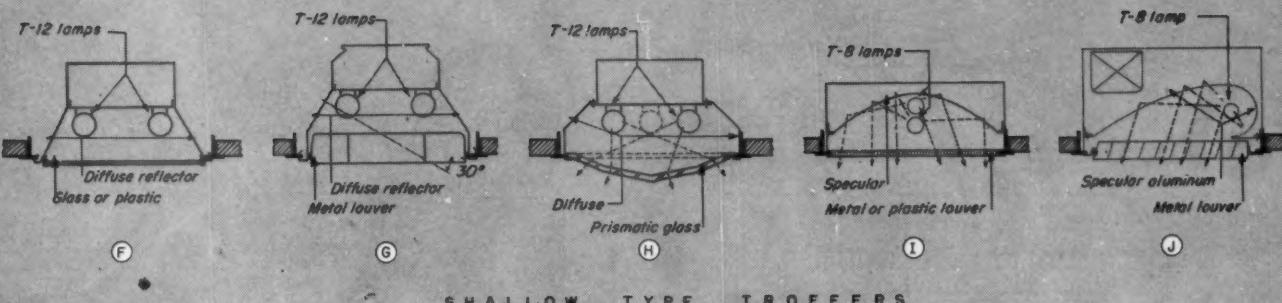
Troffer reflectors are made principally of steel and aluminum, and in several contours and finishes. Variations in shape and finish account primarily for the many troffer designs now available. Each shape and finish has its own lighting characteristics, and thereby its own advantages and disadvantages.

Most deep type troffers on the market today are of the low brightness type, in which the reflectors are of the

near-parabolic specular or semi-specular finished contour and reflect almost all of the light downward below the 40-degree glare zone. In these troffers the lamp is shielded crosswise from 40 to 45 degrees below the horizontal. Thus when viewed at right angles, with the lamp turned on, the lamp is not visible and the exposed section of the reflector appears unlighted. The reflector is usually less bright than the ceiling in which the troffer is recessed, as the ceiling itself is indirectly lighted by reflection from the room surfaces below. Viewed lengthwise, the lighted lamp tubes subtend a sufficiently small angle that their surface brightness is not considered objectionable. Baffles are used, however, to provide approximately 45 degree shielding along the troffer length for maximum lighting comfort. Five types of low brightness troffers are shown in Details A, B, C, D and E. Types A, B and C are single-lamp troffers, while types D and E are two-lamp types. Some of these are designed for use with the 40-watt T-17 low brightness lamps, as shown, which adds still greater lighting comfort.

Shallow troffers are more difficult to shield effectively than are deep troffers. Complete shielding must be provided for both crosswise and lengthwise viewing, since the lamps in shallow troffers are completely visible in the normal glare zone if unshielded. Shallow type metal louvers, diffusing panels of glass or plastic, or molded plastic forms are used for shielding these units. Glass and plastic panels are available in two types. One type provides diffusion, while the other type, of prismatic design, provides both diffusion and light control. In general, diffusing elements of either glass or plastic cut down the efficiency of the troffers slightly more than louvers and baffles of good design. However, they are considered more attractive in appearance by many, both lighted and unlighted.

Troffer reflectors form the regular troffer housing on many units, which helps to keep their cost at a minimum. This is especially true for units having diffuse reflector finish. In some units, such as types C, I and J, where specular finish reflectors are required, this is not practical and a separate housing has to be furnished.



SHALLOW TYPE TROFFERS

Lighting

Light distribution for all the troffer types shown is of a symmetric diffuse pattern through the cross-section of the units, except for type J in which an asymmetric distribution is produced. Type J is intended for use in mural lighting when recessed in the ceiling, or for a cove lighting effect when recessed with the face vertical in the wall.

Troffer lighting is relatively efficient, compared with other systems of lighting. Unshielded low brightness type troffers have the highest efficiency. Refinements in shielding and diffusion are done at the sacrifice of some efficiency, as is shown by the coefficients of utilization for troffers in Table III.

Recessed troffer lighting systems have two inherent disadvantages. One is that because the units are recessed flush in the ceiling surface, the ceiling between units receives no direct light, and reflected light is usually inadequate to dispel the unlighted appearance of the ceiling. This problem is accented by the use of flat glass or plastic diffusing elements, but is relieved slightly by the use of molded forms which extend below the ceiling. It is relieved still more by the use of low brightness troffers using the 40-watt T-17 low brightness lamps, as the brightness contrast is practically eliminated.

The other problem is that open type troffers leave the bare lamp exposed to the work surface. This creates reflected glare from any objects or surfaces which are glossy, or even semi-glossy, to an extent that it is objectionable. Use of diffusing elements soften this reflection, but do not eliminate it. Low brightness lamps in low brightness troffers also eliminate the reflected glare to an extent, but not completely at intensities of 50 footcandles and below. Tests indicate that use of higher levels of illumination, which will bring the brightness ratio of average work surfaces to the reflected lamp brightness within a comfortable range, is the most satisfactory solution.

Mounting methods for recessed troffers are available for practically all types of construction. They more or less parallel the methods generally used for trans-lighted ceilings. Some of the popular methods in general use are shown in the sketches of types A through F. As may be

TABLE III. COEFFICIENTS OF UTILIZATION FOR TROFFER LIGHTING

Type Troffer*	Type Reflector	Diffuser or Shield	Room Index**		
			B	E	H
Low Brightness Troffers					
A	Anodized	Baffles	.56	.51	.44
B	Specular	None	.63	.58	.50
C	Specular	Baffles			
D	Semi-Specular	Baffles	.43	.39	.34
E	Diffuse	Baffles	.47	.43	.37
Shallow Type Troffers					
F	Diffuse	Glass	.51	.46	.39
G	Diffuse	Louvers	.52	.45	.37
H	Diffuse	Prismatic	.58	.51	.42
I	Specular	Louvers	NA	NA	NA
J	Specular	Louvers	NA	NA	NA

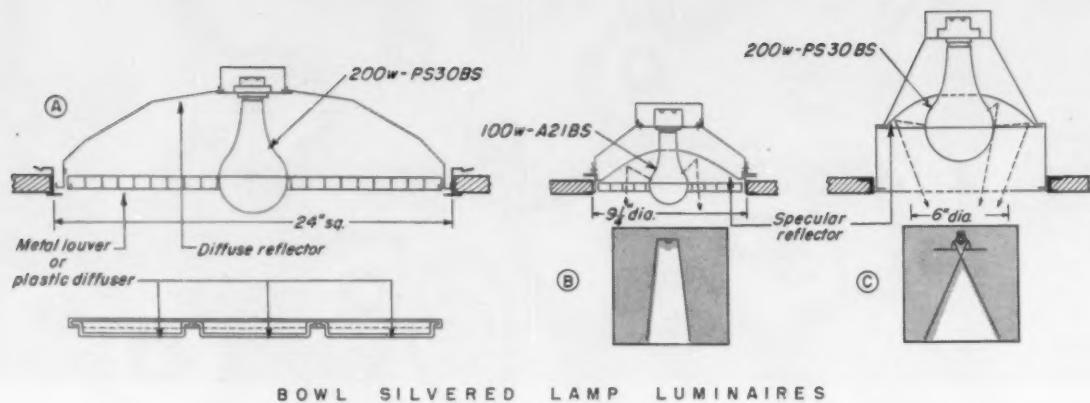
*See details in illustrations.

**Interpolate for CU values for other Room Indices, or see manufacturers' CU tables for specific troffer units.

NA—CU data not available.

seen by analysis of these mounting details, the troffers are supported from the ceiling or building structure by support rods in some instances, and the suspended ceiling grid framework and acoustical tile are in turn supported by the troffers. In other instances the suspended ceiling is supported directly from the true ceiling or building structure, and the troffers attach to the suspended ceiling for support.

The troffer lighting principle has been extended to units wider than 12 inches, usually 16, 24, 32 or 48 inches in width. These wider units employ up to eight lamps, and louvers or diffuser panels of glass or plastic. By definition, these wider units are usually referred to as large-area low-brightness luminous panels, and are normally classified as trans-lighted ceiling lighting.



BOWL SILVERED LAMP LUMINAIRES

Built-In Lighting

Recessed Incandescent Units

TABLE IV. COEFFICIENTS OF UTILIZATION FOR DOWNLIGHTS

Type Unit *	Type Reflector	Shielding	Room Index*		
			B	E	H
Bowl Silvered Lamp Units					
A	Diffuse	Louvers	.60	.53	.42
A	Diffuse	Glass, Plastics	.58	.51	.40
B	Specular	Louvers	NA	NA	NA
C	Specular	None	.53	.50	.44
Projector and Reflector Lamp Units					
D	Specular	Baffles	NA	NA	NA
E	Specular	Louvers	NA	NA	NA
F	Specular	15°	.51	.48	.41
G	Specular	45°	.54	.51	.47
H	Specular	Louvers	NA	NA	NA
Standard Lamp Units					
I	Silvered	Glass	NA	NA	NA
J	Specular	Prismatic	.47	.43	.37
K	Silvered	Louvers	.50	.43	.35
L	Specular	None	NA	NA	NA
M	Specular	None	NA	NA	NA

*See details in illustrations.

**Interpolate for CU values for other Room Indices, or see manufacturers' CU Tables for specific luminaires.

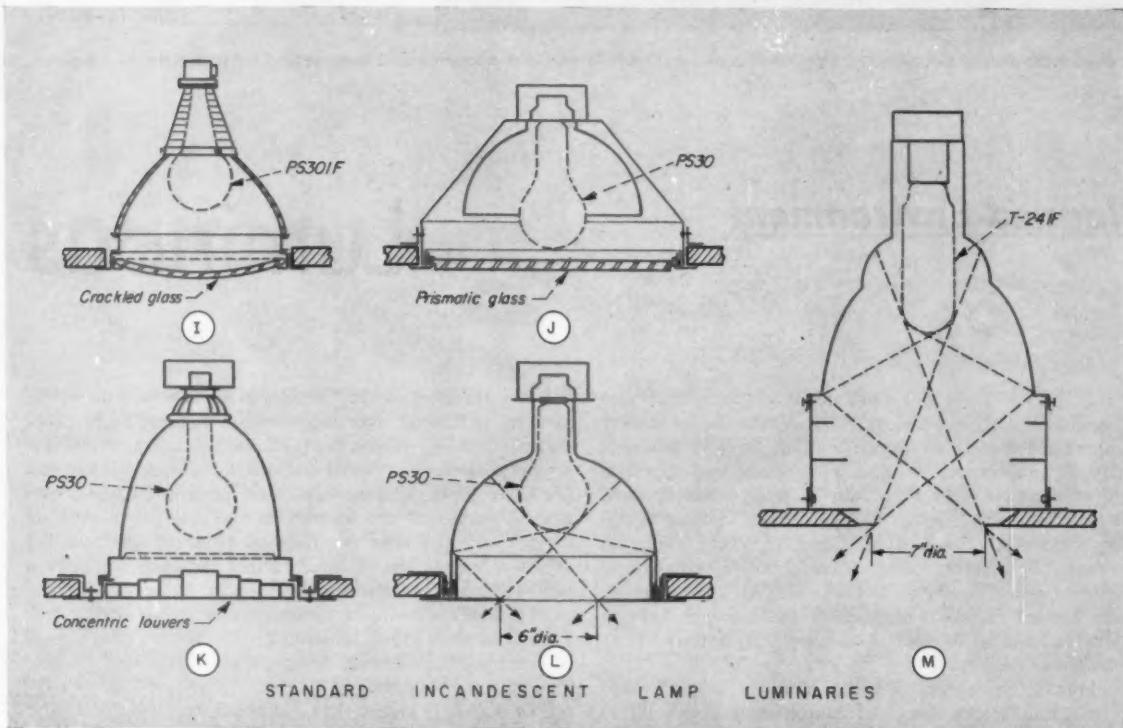
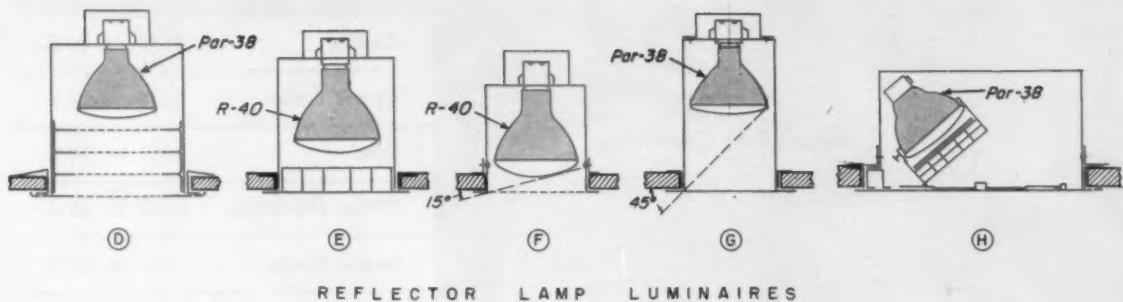
NA—CU data not available. Check with manufacturers of similar equipment for light distribution and output.

LIGHTING with incandescent lamps continues to be popular, notwithstanding the fact that fluorescent lamps are more than twice as efficient. It is not clear whether this is due to psychological reasons, to the simplicity of the lamps, luminaires and electrical circuits, or to some other unknown reason or factor. Production statistics show, however, that the number of incandescent lamps made, and the dollar volume involved, continues to increase every year.

The trend to recessed incandescent lighting began some 20 to 25 years ago. It was about that time that architects began to object to the use of "hanging fixtures" within an interior. Lower ceilings tended to make their use untenable because of increased direct glare, also required closer spacing of the units for uniform lighting, and larger wattage units to provide higher levels of illumination. By recessing the lamps in suitable reflector units within the ceiling, these problems were eliminated. Since recessed units direct all their light output downward, they are popularly called "downlights".

Incandescent lamps are "point" light sources, and therefore lend themselves to accurate control of their light output. This makes it possible to design recessed downlights for standard lamps with little or no light in the direct glare zone, by using baffles or louvers finished dull black, or by using specular finish ellipsoidal reflectors. Also, prismatic and Fresnel glass lenses are used to provide accurate control of the light, and concentric louvers are used to shield the lamps and reflectors.

Projector and reflector lamps, with their own built-in reflectors, have been adapted for use in recessed downlight units. Five typical designs are shown in sketches D to H. These lamps are considerably more expensive than standard lamps, but are now designed with 2000-hour rated life versus 1000 hours for standard lamps. This increases their practicability.



Recessed units for standard lamps have been available for many years, and modern versions are shown in sketches I to M. Type M is designed for use with a T-24 750- or 1000-watt inside frost lamp. It is normally used for recessing in high ceilings, such as in churches, auditoriums, banks, and similar areas.

Luminaires for bowl silvered lamps have been refined in design so that they are attractive, efficient and highly practical. As a result, they have increased in popularity in recent years. Typical units are shown in sketches A, B and C. The unit in sketch A is available in two sizes; one 14 inches square, the other 24 inches square. It uses bowl silvered lamps from 75 to 300 watts in size, and is available with metal egg-crate louvers or panelled plastic diffusers. It may be combined effectively with low brightness modular fluorescent panel units used for trans-lighted

ceilings, or with troffers or other recessed incandescent type units. Light distribution is diffuse.

Downlighting units vary in light distribution from diffuse to highly concentrating. Units with diffuse distribution are suitable for general lighting, while concentrating type units are used for special applications where high intensities are required over limited areas. Coefficients of utilization are shown in Table IV for many of the units shown in the illustrations on these two pages.

The color quality of recessed incandescent units, is predominantly yellowish, same as for the incandescent lamp. For certain lighting applications, such as food shops, furniture stores, restaurants, and interiors requiring a "warm" light, this color quality is usually preferred. It combines well with many areas which are fluorescent lighted, and provides accent lighting effectively.



TABLE V. REFLECTANCES FOR ROOM SURFACES

Ceiling	75% to 90%
Upper Walls	50% to 65%
Trim	40% to 50%
Office Machines	30% to 40%
Lower Walls	30% to 50%
Furniture	25% to 40%
Floors	15% to 30%

Room surfaces should all be kept as light as possible, and mat finish, for maximum visual comfort and for high lighting efficiency.

Planned Environment

THE DESIGN and layout of a good lighting system is no longer a simple problem. The system is no longer appraised merely by the amount of light it provides. Today, lighting quality is equally important, and appraisal involves even far more than that. It involves seeing comfort and human well-being. It involves the lighting equipment, the walls, ceiling, floor, furniture, every object in the room. It involves color, texture, finish, size, form, brightness, glare, highlights and shadows. All are important. These are all factors which affect the ultimate lighting results, and add up to what is now popularly referred to as the *luminous environment*.

Embracing as it does a broad range of scientific and psychological factors, luminous environment is difficult to define. Essentially, however, it is what one sees around a visual task in a visual field. As a person moves about a room, or changes his direction of view, he may see the entire interior. Thus the appearance of the entire room must be considered.

Shown at the top of this page is the picture of an office which illustrates some of the factors to be considered in planning an ideal luminous environment. Table V gives a range of reflectances for room surfaces recommended for a satisfactory luminous environment. The reflectances on the room surfaces indicated have been found by experience to provide comfortable lighting conditions, and an artistic effect which seems to be satisfactory to most people. Light and vision research (by R. J. Lythgoe, London) has indicated that as the levels of illumination increase the entire environment must be reasonably uniform in brightness, if ideal visual conditions are to obtain. Since a room with a perfectly uniform brightness throughout would be most unattractive and uninteresting, the Illuminating Engineering Society has advocated that brightnesses not exceed

a 3-to-1 variation for best results in areas where the visual problem is difficult over long periods of time, as in classrooms, drafting rooms, and offices. In areas where the seeing problems are casual and intermittent, and intensities are lower, as in the theatre, cocktail lounges, the home, etc., greater variations are permissible and may prove satisfactory. The 3-to-1 ratio is purely an arbitrary selection, but seems a logical choice until further research indicates a need for greater refinement.

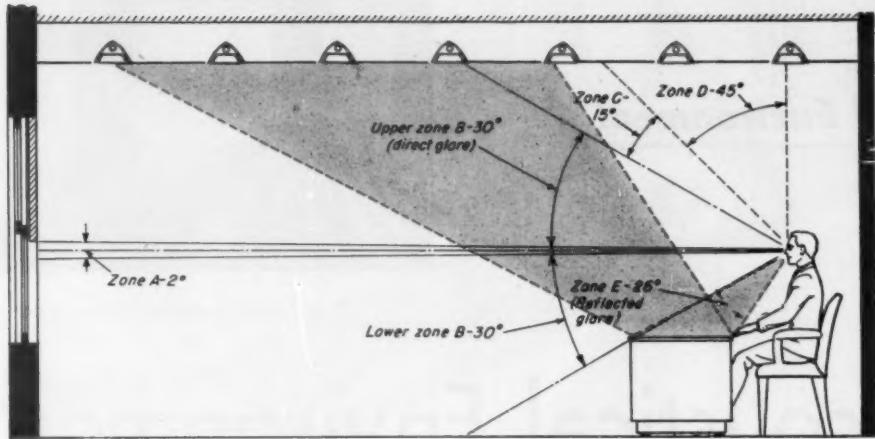
The sketch showing an office worker seated at his desk (at top of next page) illustrates other factors which must be considered in lighting design to insure the best possible luminous environment.

The worker is looking straight ahead, horizontally. Under this condition his vision is sharp in zone A, a cone 2° in diameter. He can also see in a surrounding zone B at the same time, but less distinctly. In the upper half of this zone B, the direct glare zone, which extends approximately 30° above the horizontal, are four recessed troffer units of the 45° -shielded low-brightness type. The troffers are visually comfortable, since they are properly shielded against direct glare. In zone B below the horizontal there are no primary light sources, so if these surfaces (floor, furniture, lower walls, etc.) have a low reflectance and a mat finish, this area will be visually comfortable.

Zone C extends from zone B up to the 45° angle. In it is one troffer, and this may be considered in the direct glare zone, but the lamp is still shielded from the worker's view. Zone D, a 45° angle, is out of the range of normal view of the operator, so the two troffers in this area do not cause any discomfort.

Now assume that the worker directs his vision to a visual task on the center of his desk. Sharp vision will still obtain in the central 2° cone, and he will be able to see in a sur-

Luminous



Quality lighting requires shielding of light sources in direct glare zone and minimizing of reflected glare.

Environment

rounding field embracing a cone approximately 60° in diameter. That means that he can see his entire desk top, which embraces an angle of only 26° , as well as an outer surround area. If his desk top has a specular finish, or any degree of gloss, the four troffers occurring in the 26° angle as reflected from the desk top can be seen by reflection. Since the troffers are recessed, their brightness exposed to the desk top will be in excess of the reflected ceiling between the troffers, which is lighted only by reflection from below. This contrast in brightness will be reflected from the glossy desk top as reflected glare. Its severity will depend on the contrast in brightness between the troffer and the ceiling, and the degree of gloss on the desk top.

Solution to this problem is to use only mat finishes on all room surfaces and on all furniture and equipment to prevent specular reflection. Also helpful will be the use of lighting intensities sufficiently high so that reflection of the light source (brightest part of the troffer unit) will be approximately the same as the reflected brightness of the visual task or other objects in the room. Usually intensities of 50 footcandles or above are satisfactory.

The use of dark ceilings (black, royal blue, hunter green, etc.) and recessed "downlight", as recommended by some architects and decorators, sets up an intenable reflected glare condition which should always be avoided in any location where "seeing" problems are involved.

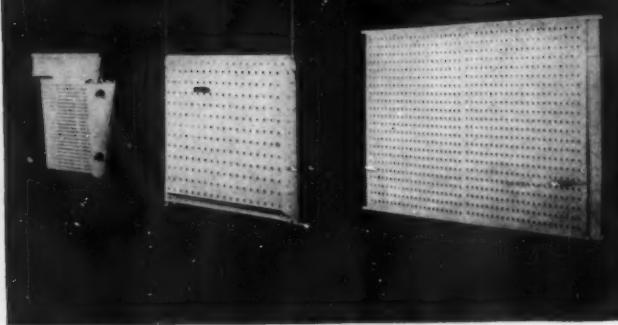
In modern new buildings where architects make use of broad expanses of all-glass outer walls, in an effort to make greater use of daylight, or for esthetic and design reasons, these glass areas should be equipped with venetian blinds, exterior louvers, or other practical means for shielding. Otherwise skybrightness will become a most annoying source of glare; both direct, for persons near the wall, and reflected, for persons farther inside the room.

The selection of room colors and finishes, and of furniture, etc. is normally made by the owner, architect, decorator, or someone other than the lighting engineer. However, since color and finish of these surfaces, the use of all-glass walls, and many other factors, have a direct influence on the luminous environment, and since the lighting engineer has the responsibility of providing a satisfactory luminous environment, it is important that he be fully informed on all these matters, and that he make these facts known to the owners. By accepting this responsibility and by working closely with the architect, decorator, owner or others who may be involved, he can provide for comfortable seeing and happier living through an ideal luminous environment.

TABLE VI. RECOMMENDED BRIGHTNESS RATIOS FOR
INTERIOR LIGHTING

In Visual Field . . .	Ratios
a. Between visual tasks and adjacent surroundings (e.g.—white paper and desk top)	1 to 1/3
b. Between visual tasks and more remote darker surfaces (e.g.—white paper on desk and floor)	1 to 1/10
c. Between visual tasks and more remote brighter surfaces (e.g.—white paper on desk and luminaires)	1 to 10
d. Between luminaires and adjacent surfaces in normal field of view	20 to 1
e. Anywhere within normal field of view (e.g.—between luminaire and floor)	40 to 1

Planned Environment



Acoustical baffles for lighting systems.

Acoustical Environment

TABLE VII. SOME TYPICAL ABSORPTION COEFFICIENTS

Material	Light Reflection	Frequency (CPS)			
		128	512	2048	NRC
Standard Acoustical Materials*					
Travertone	78	.06	.70	.80	.65
Acousti-Celotex Type M-7	77	.39	.74	.98	.75
Fibreton	78	.14	.73	.78	.65
Fiberglas Type TXW	77	.66	.82	.95	.85
Combined Light and Sound Systems**					
Luminous Ceiling With Baffles	—	.35	.37	.57	.40
Luminous Ceiling Baffles Only	—	.33	.93	.87	.90
Grid Lighting System With Baffles	—	.05	.41	.52	.35
General Building Materials and Objects***					
Brick Wall, Painted	—	.01	.02	.02	
Carpet, Felt Lined	—	.11	.37	.27	
Fabrics, Medium Weight	—	.06	.13	.40	
Linoleum On Concrete	—	.02	.03	.04	
Glass	—	.04	.03	.02	
Plaster on Metal Lath	—	.04	.06	.04	
Wood Panelling	—	.10	.10	.08	
Person, Adult	—	2.5	4.2	5.0	
Person, Child	—	1.8	2.8	3.5	
Chairs, Metal or Wood	—	.15	.17	.20	

*Trade names selected at random from Bulletin XIV-1953, "Sound Absorption Coefficients of Architectural Acoustical Materials," published by Acoustical Materials Association, 59 E. 55th St., New York 22, N. Y. Bulletin gives complete data on a wide range of acoustical materials.

**Most lighting equipment manufacturers supplying acoustical equipment can furnish full acoustical data.

***Complete absorption coefficient tables may be found in various books on architectural acoustics. Use 512 cps frequency values for average conditions such as offices and classrooms, where noise reduction coefficient (NRC) is not given.

TABLE VIII. ACoustICAL CALCULATIONS FOR TYPICAL OFFICE

Assume Room Size = 30 x 50 x 12 = 18000 cu. ft.				
Surface or Object	Dimension	Area	Coef.	Sabines
Floor (Linoleum or concrete)	30 x 50	1500	.03	45
Window Walls (Two Adjoining Walls)	30 x 12	360	.03	11
Plaster Walls (Opposite Windows)	50 x 12	600	.06	36
Luminous Ceiling With Baffles	26 x 46	1196	.40	478
Travertone Ceiling Perimeter	2' wide	304	.65	218
Workers in Area (adults)	15		4.2	63
Total Sabines				891

$$T = \frac{.05V}{a} \quad 05 \times 18000 = 1.01$$

When plotted on the "Reverberation Time" chart, this value falls within the acceptable range and may therefore be considered satisfactory for a room of this size.

TABLE IX. SABINE FORMULA FOR ACoustICAL CALCULATIONS

$$T = \frac{.05V}{a}$$

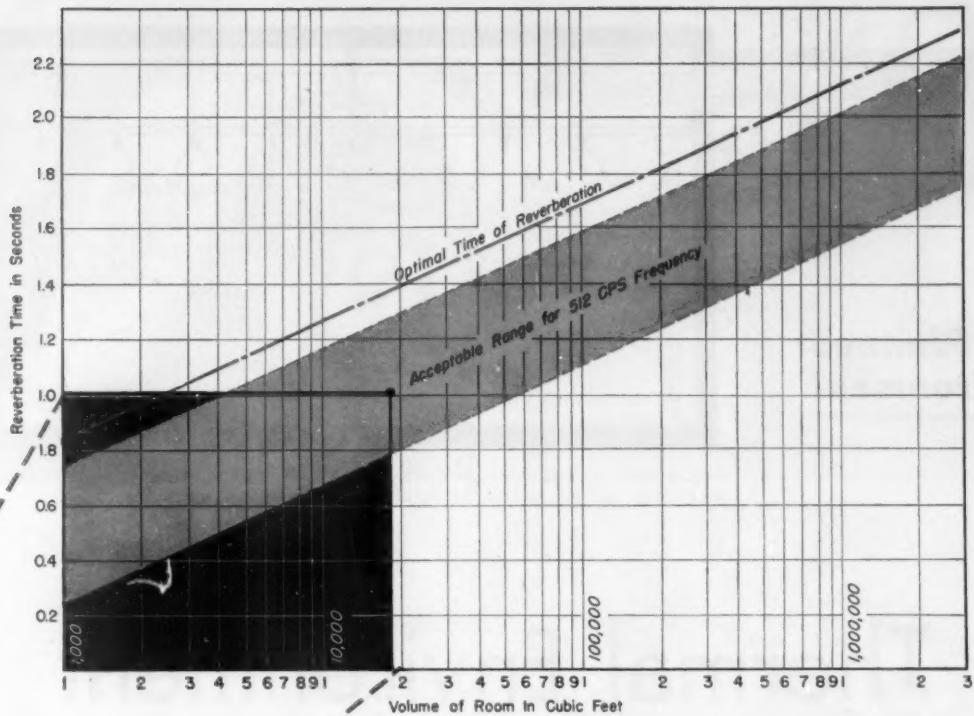
where

T = Reverberation time in seconds

V = Volume in cubic feet

a = Absorption units in "sabines"

(Absorption of various surfaces is found by multiplying the area in square feet by the absorption coefficient for the material. Similarly absorption of objects is found by multiplying the number of objects by the absorption coefficients for each.)



Reverberation time for rooms of various sizes, when plotted on the above chart, should fall within shaded area for satisfactory sound control.

MANY factors must be combined to provide a planned acoustical environment. These include noise reverberation characteristics of the enclosure (store, bank, office, auditorium, room, lobby, etc.), whether the noise is continuous or intermittent, high or low pitched (frequency), diffused throughout the area uniformly or focused in certain small areas, etc. Too much noise can cause irritability and be most distracting; too little noise can likewise be extremely disagreeable. A carefully planned balance provides the best results.

In solving acoustical problems, materials having a high absorption coefficient are normally installed in the enclosure to aid in the control of sound. Acoustical tile is the most common type of material used, and it is usually installed on the ceiling, or in a suspended ceiling. Built-in lighting is also normally installed in the ceiling. Thus light and sound conditioning are closely associated, and installations involving both systems must be carefully integrated and closely coordinated for best results.

With the trend to built-in lighting growing, the lighting engineer will face more and tougher acoustical problems. In the main these problems should be solved by acoustical experts, but if the lighting engineer has some knowledge of acoustics and sound control it is believed he can do a better job of lighting design and layout.

One measure of acoustical quality in a specific enclosure is appraised by the control of sound reverberation in that enclosure. Sound travels at 1120 feet per second, in a straight line, and is audible at frequencies ranging from about 20 cycles per second to 15,000 cycles per second for the average person. Reverberation is a function of the volume of a room, and is calculated by a simple formula developed about 1895 by W. C. Sabine, who has done

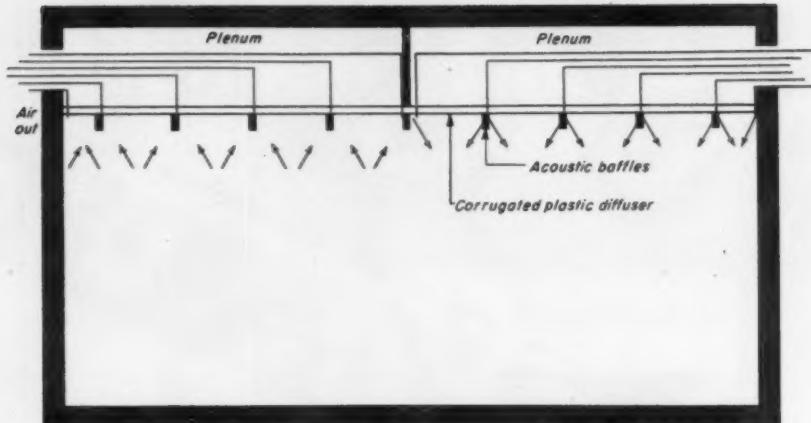
considerable research on sound characteristics and behavior. This formula is given in Table IX.

When sound strikes a surface or an object, it reacts exactly the same as light. Some is absorbed, and some reflected. Also, the sound wave is reflected from a surface at an angle of reflection equal to the angle of incidence, the same as light. Thus room contours affect the acoustical properties of the enclosure. It should be remembered, however, that changing the direction of a sound wave does not reduce its noise level, except to the extent it may be absorbed by the surface which it strikes.

The absorption of any surface or object can be accurately measured. This has been done for acoustic materials, combined light and sound systems, and objects normally found in room enclosures. This absorption is expressed as an absorption coefficient, which is measured at various frequencies (usually 128, 256, 512, 1024, 2048 and 4096 cycles per second) and then averaged for a simple noise reduction coefficient (NRC) for the material. Total absorption of a surface of a specific material is measured in units called "sabines", and is the product of the square foot area of the surface multiplied by its NRC. This gives the absorption (or "a") for any material or object for use in the reverberation time formula given in Table IX.

Reverberation time may be calculated for any structural enclosure when the NRC value is known for all the materials used in the enclosure surfaces. An example is given for a typical office in Table VIII, and the resulting reverberation time for the 18,000 cubic foot area has been plotted on the "reverberation time" chart above. Since the point falls in the center of the shaded area, it is indicated that the noise level will be acceptable, and within the comfortable range.

Planned Environment



Low velocity air circulation through trans-lighted ceilings using corrugated plastic is practical and economical, offers alternate to standard techniques.

Thermal Environment

THE control of temperature and humidity in today's modern buildings for the comfort of the occupants provides what may aptly be called a *thermal environment*. The temperature and humidity level may be selected and controlled for any type of interior to suit the existing special conditions and activities. This involves both heating and cooling, according to the geographic location of the building and the season of the year.

The illuminating engineer must consider the thermal environment of any interior for which he is designing a built-in lighting system (or any other type of lighting system, including daylight) for two main reasons: (1) a built-in lighting system creates heat which must be removed by the cooling system; and (2) the ceiling is used for the recessing and support of air conditioning outlets in most conventional systems, as well as for the recessing and support of built-in lighting equipment. The exact same locations on the ceiling are usually selected as being most desirable for equipment in each system.

While the lighting engineer need not be a heating and ventilating expert, it is certainly most desirable that he know as much as possible about both subjects. Only through such knowledge can he design the most economical lighting system, since the size of the cooling system is influenced by the amount of heat generated by the lighting system, and psychological comfort of room occupants may be influenced considerably by the amount of radiant energy present in the lighting system. More knowledge on his part about heating and cooling techniques will also help insure a comfortable thermal environment.

Also, rapid strides are being made in built-in lighting techniques, especially in the trans-lighted ceiling field. New methods of air diffusion are now being studied for use with such new built-in lighting systems, and there is need for further study and exploration in both fields.

There are two types of heat generated by lighting systems which must be considered by the air conditioning engineer; hence is also a problem for the lighting engineer. One is the heat from the total energy (watts) load, and the other is the heat from the total radiant energy load. The first heat load is easy to compute. As is shown in Table XI (next page), a lighting kilowatt produces 3414 Btu's per hour. Further, the heat produced by 3500 watts of lighting load, including the watts loss in ballasts in fluorescent lighting systems, requires an air conditioning capacity of one ton for its removal from a room.

Analysis of the radiant heat problem is more complicated. Visible and infrared radiation is converted to heat when it strikes an object or surface and is absorbed. These objects or surfaces (furniture, floors, walls, etc.) become warm as a result and act as radiators. The human body absorbs this radiation readily, and is highly sensitive to it. The solution is to reduce the air temperature still further, to counteract the additional converted heat energy, but since human reaction is involved, the extent of reduction of the temperature is not determined by scientific formula.

This radiant energy varies in different types of light sources, as shown in Table X (top next page). Values are given for a standard 40-watt type T12 fluorescent lamp and for a standard 150-watt type A inside frosted incandescent lamp. These two lamps were selected because their total light output is approximately the same. The radiant heat energy in the incandescent lamp is approximately 80%, or 120 watts, while in the fluorescent lamp it is approximately 40%, or 18.8 watts. Thus it is evident that the radiant heat per footcandle of illumination from the fluorescent lamp is only a fraction of that from the incandescent lamp. Where a comfortable thermal environment requires considerable cooling it will therefore generally be desirable and economical to use fluorescent lighting.

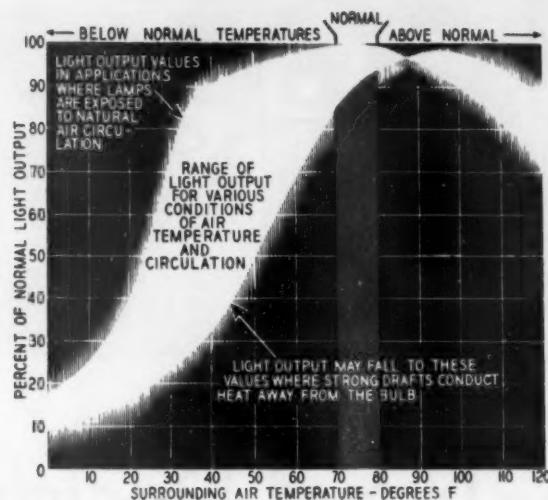


TABLE X. LIGHT SOURCE ENERGY OUTPUT

Energy	F40T12 Lamp		150A Lamp	
	%	Watts	%	Watts
Visible radiation	17.0	8.2	10	15
Heat radiation	22.1	10.6	70	105
Heat conduction and convection - (Lamp)	44.2	21.2	20	30
(Ballast)	16.7	8.0
Total	100.0	48.0	100	150
Radiant heat energy	39.1%		80%	
BTU's per hour	163		510	
Total light output (Lumens)	2550		2650	

In general, design criteria for comfort air conditioning of interiors include the removal of heat from heat sources within the conditioned space, which includes the lighting heat load, and of heat which is transmitted to the conditioned space from outside heat sources, including the sun. The lighting heat load has been increasing in size and percentage of the total heat load to be dissipated from the space, as lighting intensities have continued to increase. The range for lighting loads in commercial interiors is from about 5 watts per square foot for offices, schools, libraries, etc., to as much as 15 watts per square foot for specialty stores. Installations using up to 25 watts per square foot have been reported for special lighting applications, excluding show window and display lighting. Such heat loads therefore become a major factor in air conditioning, and deserve full study and consideration of lighting engineers in the interests of economy.

Comfort air conditioning involves the simultaneous control of temperature, moisture content, movement and quality of the air in enclosed spaces intended for human occupancy. Lighting engineers are concerned principally with control of the air movement, insofar as built-in lighting systems are concerned. One approach is to use standard air diffusers and air duct systems such as are normally installed in the usual plaster or acoustic tile suspended ceiling, fitting the built-in lighting system around it. Another approach is to introduce air into the room through a trans-lighted ceiling by using the cavity above the ceiling as an air plenum. Studies already completed indicate this method is satisfactory for ordinary ventilation and air conditioning requirements, and that neither air pressure drop nor the noise level resulting from the air flow are excessive.

A third approach is to introduce air to the room through the perforated sound baffles used for sound control with luminous ceilings. Preliminary tests indicate this system is satisfactory, but more studies are needed to provide full data.

There is the possibility of removing heat from built-in lighting equipment by using forced air through the equipment, so that the heat load is dissipated directly without going through the air conditioning system. This has been done successfully in show window lighting, and one such

cove lighting system has been reported. When fluorescent lamps are used, however, care should be exercised to prevent air drafts over the lamps, which affects their light output as shown in the chart at the top of this page.

Some manufacturers of air conditioning equipment now have available air diffuser outlets in modular dimensions (12" x 12", 12" x 24", 12" x 48", 24" x 24", etc.) for installation in suspended ceilings using standard modular panels of acoustic tile. Good design practice would include similar modular lighting elements, even modular electric heating panels, which could be interchanged freely.

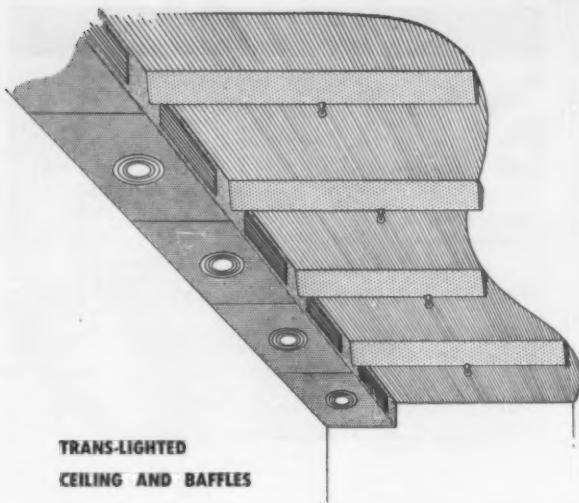
The heat problem from lighting systems varies geographically. In northern latitudes air conditioning is used for only three or four months throughout the year. For the remainder of the year heat from lighting systems may be used to supplement the regular heating system. However, lighting engineers who are well informed on the fundamentals of good heating and air conditioning practices, are well equipped to design the most satisfactory lighting system and to aid in the design of a comfortable thermal environment.

TABLE XI. HEAT FROM LIGHTING LOAD AFFECTS AIR CONDITIONING

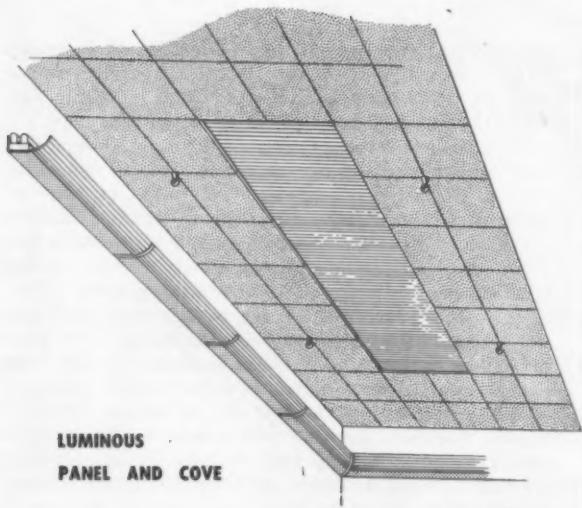
1. Heat from a lighting load is measured in —
BTUs per hour
2. A lighting system produces a BTU per hour heating load equal to —
Lighting Kilowatts^{*} x 3414
3. Required tons of air conditioning to remove a lighting system heat load is equal to —
BTUs per hour (from 2)
12000
4. One ton of air conditioning capacity will remove the heat for a lighting load of 3500 watts

^{*}Add both lamp wattage and ballast watts loss for fluorescent lighting systems.

SIX ELECTRIC CEILING PLANS SHOWING

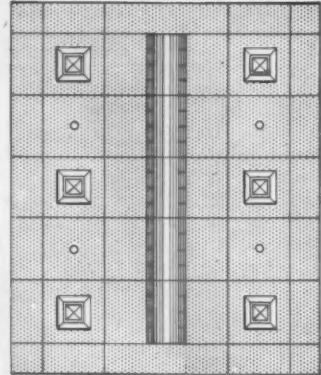
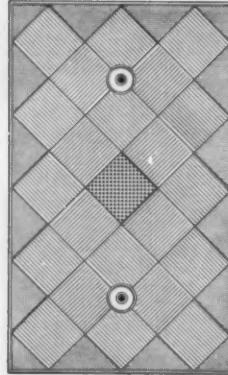
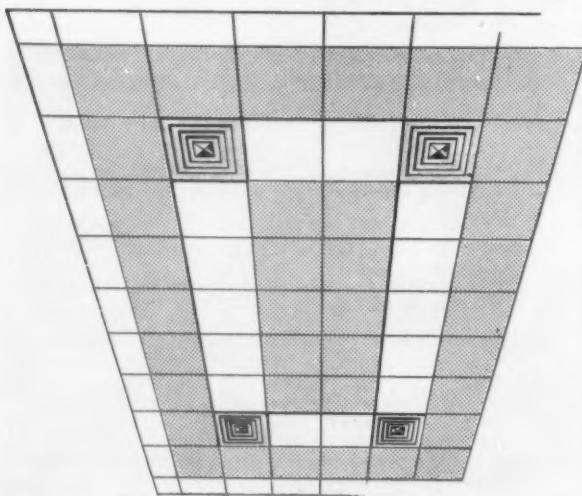


TRANS-LIGHTED
CEILING AND BAFFLES



LUMINOUS
PANEL AND COVE

MODULAR PLASTIC DIFFUSERS



New Design

VAST progress has been made in lighting design and application over the past nine years. This has occurred postwar, following a period of about four years during the war when commercial lighting design was at a standstill. As has been pointed out in the preceding pages, the major progress has been in built-in lighting systems and application techniques. But where to now? In what direction will lighting design go now? In what direction should it go?

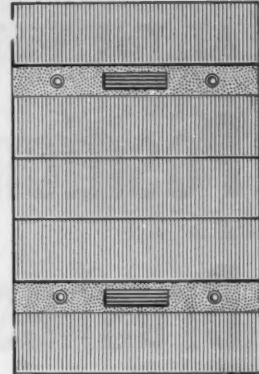
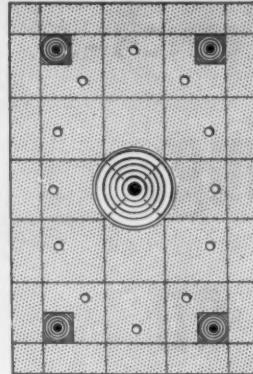
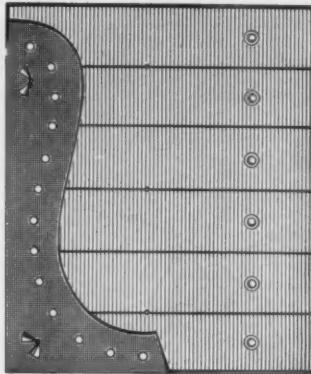
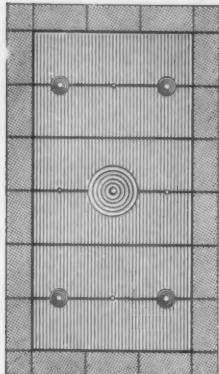
Analysis of today's building design trends, and of available lighting equipment designs, provides a sound basis for conjecture. Today's buildings are constructed of new materials, with new structural designs. Ceilings are lower. Walls are thinner, and exterior walls have extensive areas of glass. More mechanical and electrical devices are used, and have to be concealed or otherwise provided for. Greater demands than ever are made for ceiling space—for lighting, acoustical material, air conditioning outlets, sprinkler valves, inter-com speakers, etc. The ceiling must serve as an attractive enclosure for the top part of the room. And usually it conceals a maze of pipes, ducts, wires and cables, and miscellaneous mechanical service equipment.

Experience with trans-lighted ceilings indicates that at least 50% of the ceiling area should be devoted to luminous sections for best lighting results. Reasons for this are discussed on the preceding pages, especially under "Luminous Environment." Since this is true, why not have an "electric ceiling?" And if an electric ceiling is provided, why not have modular elements which can be put together in a variety of design patterns, to fit the particular lighting and environmental requirements of each area to be lighted?

Shown on these two pages are a number of electric ceiling designs. These have been designed and sketched by industrial designer Ted Mehrer, based on the concept of modular designs in electric ceilings. The wide variety of design treatments shown illustrates the practicability and flexibility of the idea. In fact, any of the designs shown are practical and can be installed today, using presently available equipment. Such installation would not fulfill the electric ceiling and modular element concept, however.

As conceived, the electric ceiling would use a T-bar type of framework which would have full modular design flexi-

DIFFERENT DESIGN COMBINATIONS OF TYPICAL BUILT-IN MODULAR ELEMENTS.

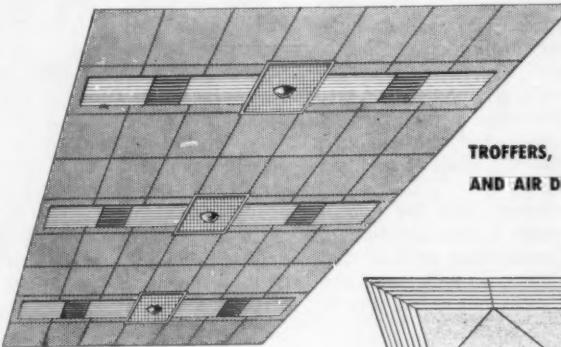
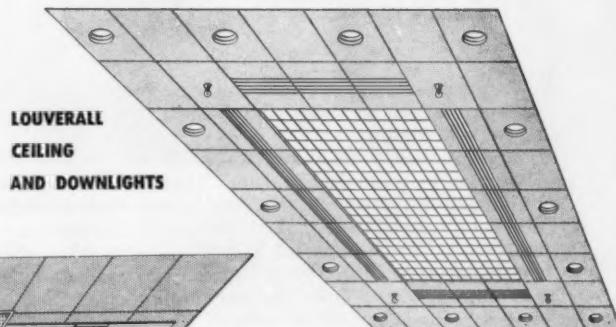


Ideas for Electric Ceilings

bility. Various modular dimension openings could be provided by the T-bar supports. Then built-in lighting units, sound control units, air conditioning diffuser outlets, sprinkler heads, etc., could be designed to modular dimensions for inserting in the proper T-bar support locations. Lighting and electrical devices could be connected to a grid design wiring system installed on the true ceiling in the plenum cavity. Electric ceilings would be produced and supplied by lighting equipment manufacturers, sold through electrical distributors, and purchased and installed by electrical contractors. Some installations have been custom-made and sold on this basis. The idea is entirely feasible and practical.

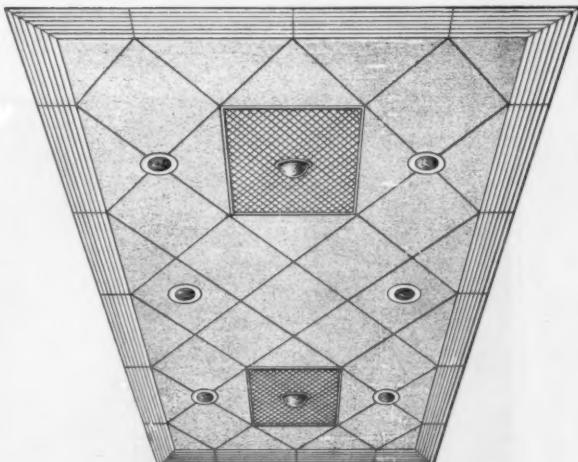
Technical data and information presented in this editorial feature were supplied by lamp and lighting equipment manufacturers, and others, including: Benjamin Electric & Mfg. Co., Century Lighting, Inc., Curtis Lighting, Inc., Daybrite Lighting, Inc., General Electric Co., Lamp Dept., Edw. F. Guth Co., Luminous Ceilings, Inc., Marlux, Inc., Miller Co., Skylike Lighting, Inc., Smithcraft Lighting Division, Solar Lighting Co., Sylvania Electric Products Inc., F. W. Wakefield Brass Co., Westinghouse Lamp Division, Acoustical Manufacturers Assn., Heating, Ventilating and Air Conditioning Guide (ASHVE), and the Illuminating Engineering Society.

The electric ceiling idea has also been discussed with several prominent electrical contractors across the nation. In general, they all agreed the idea is practical, that such a ceiling offers no unusual installation problems, that it provides an opportunity for market expansion, and that they would be willing to promote and sell it.



**TROFFERS, DOWNLIGHTS
AND AIR DIFFUSERS**

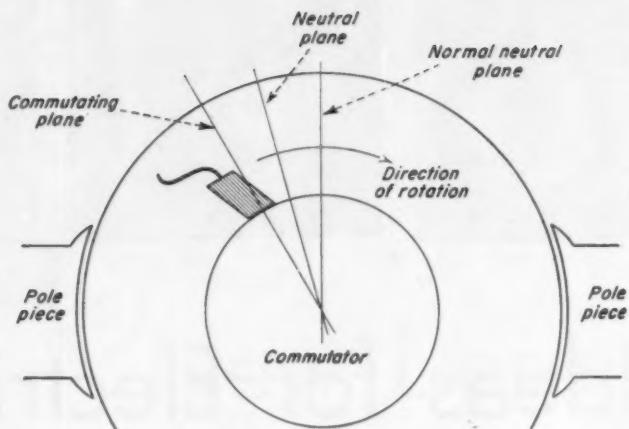
TROFFER PERIMETER AND DOWNLIGHTS



Positioning Brushes on DC Motors

By **Walter J. Prise**,

Chief Engineer,
Queens Electric Motors, Inc.
Jamaica, N. Y.



Proper positioning of brushes on the commutator of any dc motor is essential to long brush life and efficient operation of the motor.

Brushes should be so positioned on the commutator surface as to minimize sparking. These brush positions correspond to places on the commutator surface where minimum current flows through the contact between commutator and brush. Current is at a minimum when coils are passing at "neutral" point between two poles of opposite polarity. Fig. 1 shows the relationship between brush, pole pieces and commutator surface.

- The *normal neutral plane* is the position of zero induction, assuming no distortion of the field.
- The *neutral plane* is the position of zero induction with distorted field which is the result of armature reaction.

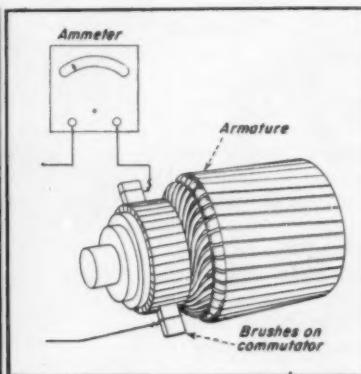
In a motor, the brushes are moved from the normal neutral plane in a direction opposite to the direction of armature rotation. The brush is adjusted to find that point on the commutator where the coil undergoing current reversal is moving in a flux of such density and polarity

that a voltage is induced in the coil to oppose and neutralize the impressed voltage on the coil. This action will then aid in reversal of the current in the coil.

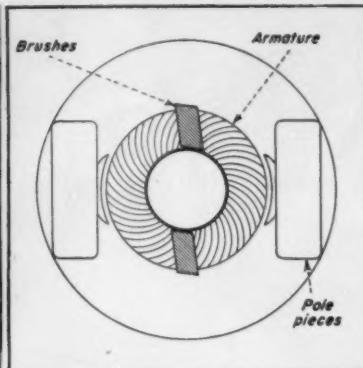
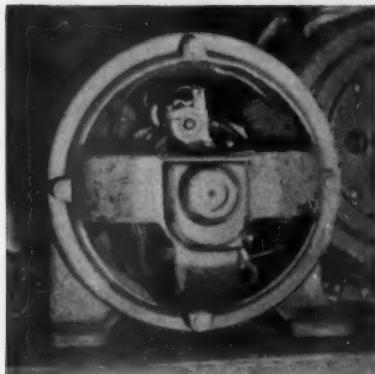
The commutating plane is the plane that passes through the axis of the armature and the center of brush contact with the commutator.

The point of minimum sparking—the proper position of a brush—is called the "neutral" position. In most modern machines, all brush holders are properly spaced in the rocker arm or moving end bell of the machine. It is, therefore, only necessary to find the neutral position for one brush. If spacing between brushes is not fixed by construction of the motor, the circumference of the commutator must be measured and divided into a number of sections, depending upon the number of brushes used. The brushes are then spaced accordingly, after the neutral position is determined.

In the experiments shown here, it is assumed that the motor is assembled correctly and there is no shift in neutral position due to defects in the armature winding or other parts of the motor.

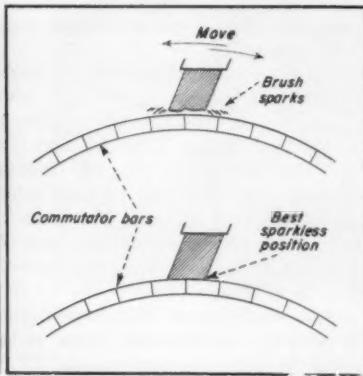
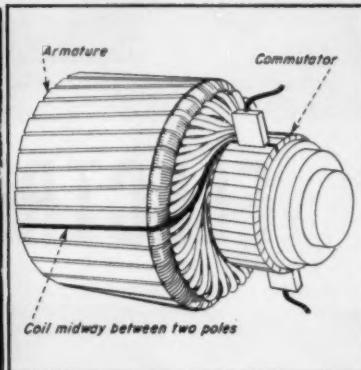
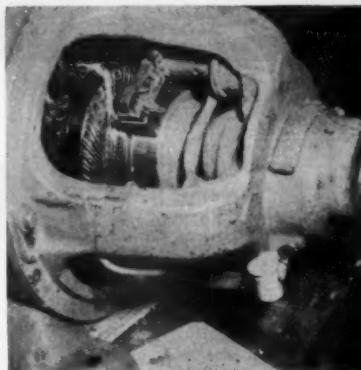


STEP 1. Locating commutating plane by use of an ammeter. Here, an ammeter is connected in series with the armature and the motor energized. By shifting the end bell in bolt slots provided for this purpose on some motors or by moving a rocking arm which holds brush holders in other motors, the brush position can be varied until minimum deflection of the meter pointer is obtained, indicating the brush position in the commutating plane.



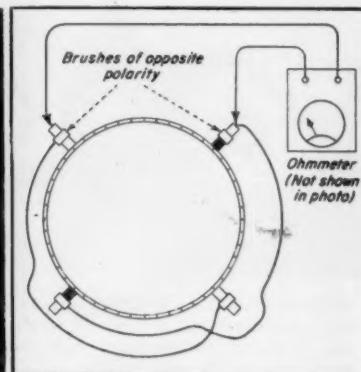
STEP 2. *Positioning brushes by checking armature coils and connections to commutator riser.* If an armature is wound straight and the coils are connected to the commutator bars directly in front of them, the neutral position can be found approximately by locating the point of brush contact with the commutator midway between two adjacent pole pieces.

STEP 3. *Finding neutral position when coils are not connected to commutator bars directly in front of them.* Often, armatures are wound in such a way that a coil located in a slot midway between two adjacent poles is not connected to a commutator bar directly in front of it. Instead, there is an angular displacement between the coil position and the commutator bar. Neutral position of brush can be found by simply following the bend in the armature coil down to the commutator bar, as indicated in the diagram and by the white mark in the photo.



STEP 4. *Positioning brushes by observing sparking.* The most practical and very common method of positioning brushes is by observation of sparking. By shifting rocker arm or the end bell governing position of brush holders, with the motor running, the sparkless position can be quickly and easily located. This practical test, in general, gives satisfactory results. For best results, full load conditions or conditions under which motor will operate should be duplicated. Diagram and photo indicate the very simple details of this operation.

STEP 5. *Checking brush holders for faulty connections.* While working on problems of brush positions, it is advisable to check brush holders for possible faulty connections between holders holding brushes at opposite polarity. Simple check shown here consists in bringing probes of test lamp or ohmmeter into contact with adjacent brush holders. If the test lamp does not light or the ohmmeter shows infinite resistance, there is no connection between the two. The brush holders are, therefore, free of faulty connections and properly connected.





Truck depot for electrical contractors' vehicles displayed license plates from many states outside the stricken area.

ELECTRICAL TEAMWORK . . .



HYDRAULIC BOOM BUCKET, with jack-knife extension and controls for rotating and elevating working level, was common sight during repair period.

SPACED just 11 days apart, two hurricanes last month handed New England a property damage bill for over \$500-million, killed 63 people, knocked 270,000 phones out of service and left a million families without electric service.

Modern structures and historic landmarks suffered, for a 649-foot television tower was brought crashing down over station WBZ-TV and the 100-foot steeple of the Old North Church (in which two lanterns were lighted in 1775 to warn Paul Revere that the British were coming) toppled into Salem Street to become a twisted pile of kindling.

Electrically, both the Boston and Providence metropolitan areas came close to being counted out as TKO victims for, although utility generation stations remained in service, pole-lines were ripped to ribbons, aerial transformers were bounced to earth, more than 26 million feet of cable had to be restrung, motors by the thousands were inundated either by fresh or salt water, switchgear and control equipment was gummed by debris, and other electrical equipment was battered either by the 100-mile-an-hour winds or by flood waters that turned city streets into boiling canals.

These twin maelstroms of roaring destruction also swept away beach-front cottages by the hundreds, choked Boston's inner harbor, with battered

fishing boats and pleasure yachts, uprooted trees that had withstood rough weather since the time of the Revolution, smashed windows and elevated signs indiscriminately, and crushed autos as though they were paper.

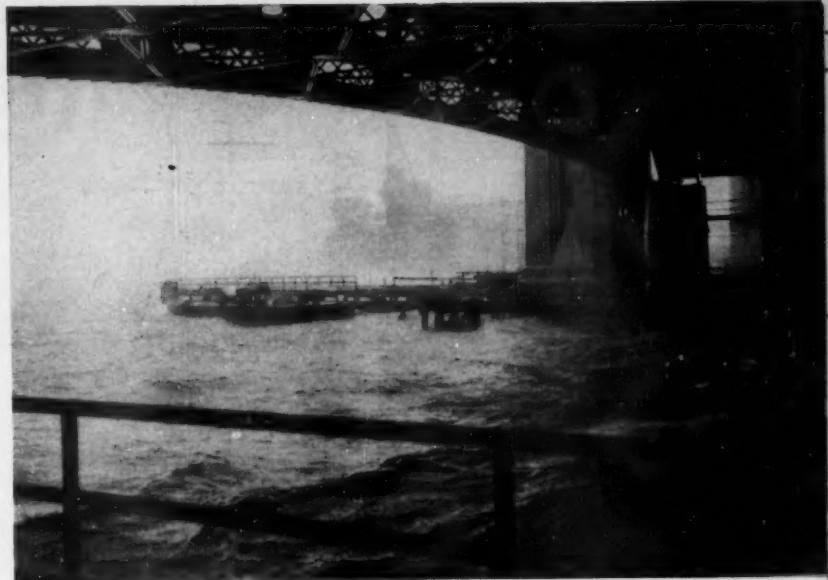
With power lines down and basements flooded, hundreds of industrial plants were either partially or totally paralyzed. Residential service drops were also ripped away, sump pumps were short circuited, oil burners were knocked out and refrigeration ceased, as did air conditioning units and lighting systems by the thousands.

As the storms blew northward to extinction, the gigantic clean-up job began with states of emergency proclaimed in both Massachusetts and Rhode Island. State legislatures promptly approved a \$12-million relief fund, and President Eisenhower allocated an additional \$1½-million to this sizeable disaster kitty.

That loss of life was not greater was due in large measure to the splendid work of the U. S. Weather Bureau, for the central tracks of the storms were checked constantly as they crept northwards from the Florida coast, and local radios gave public warning hours before the storms struck.

Advance action was also taken by many New England power companies for, as soon as it became evident that local manpower and repair equipment would be overtaxed, orderly emer-

When disaster staggered New England last month, scores of out-of-the-area electrical contractors rushed in men, materials and equipment to help local utility companies in their gigantic restoration effort. Motor repair shops were also swamped with salvage work.



... Clears Hurricane Damage

gency calls for aid went out to other sections of the country in accordance with pre-arranged disaster plans.

Response was both prompt and widespread, with line trucks and crews by the hundreds dispatched New England-wards even while the storms were in progress. Many trucks rolled under their own power (some with police escorts to clear the way), while others headed towards the hurricane area atop railroad flatcars. Crews without trucks also arrived by chartered planes, buses, trains and private cars, some coming from as far distant as Michigan, Maryland, Ohio and New Jersey. For example, for Hurricane "Carol" alone, the Boston Edison Company received assistance from 17 other utility companies located in 8 states, representing a total manpower pool of 1623 men divided into 214 crews. In addition, they also received help from 14 out-of-state electrical contractors equipped with trucks for line and pole service, and scores of contractors in the immediate vicinity (both with and without heavy line equipment) volunteered their services unreservedly. Collectively, for the two storms in the Boston area, this army of emergency workers approximated 3000 and, since Providence and other metropolitan areas were similarly aided, the overall manpower contribution constituted an impressive Operation Helping Hand.



PROPERTY DAMAGE was severe; falling transformers requiring extensive repair work and auto hardtops smashed by toppled streetlight standards.



ELECTRICAL TEAMWORK (cont.)



LEFT HANGING in mid air, many transformers had to be eased to earth, minutely checked for damage, then either remounted on new poles or replaced.



TELEVISION TOWER of Station WBZ-TV became mass of twisted spaghetti when 649-foot pylon toppled before 100-mile-an-hour winds. Hitting historic as well as modern structures alike, Hurricane Carol also sheared off the 100-foot steeple from the famed Old North Church.



UPROOTED TREES ripped away power lines, smashed homes, damaged pavements. Lack of power dramatically emphasized dependence on electricity by 20th-Century property owners.



SNAPPED AT THE BASE, many poles hurled tangled wires across thoroughfares. Main area circuit breakers were pulled to eliminate hazard of live wires.

All of these men operated on a 14-hour workday schedule (from 6 a.m. to 8 p.m.). To house them, leading hotels cancelled conventions and turned away their normally lucrative tourist trade. And, to feed them, blanket cooperation was received from churches of all denominations, civic groups, the Salvation Army, American Legion and private townspeople in large numbers.

As one linesman put it: "To say that the people were grateful would be putting it mildly." Another electrician added: "I've done a lot of emergency work all over the country but have never seen anything like this hospital-

ity before". And a third stated: "We're receiving more honest-to-goodness kindness and consideration from these townspeople than we've ever experienced before."

This all-out hospitality on the part of the private citizens was promptly and effectively repaid, for in the Boston area (where Carol had disrupted service to 175,000 private homes), all but 1800 services were restored by the end of the second day.

Restoration work was truly an impressively cooperative venture, for union electricians worked side by side with independents, plant maintenance men gave peak cooperation to per-

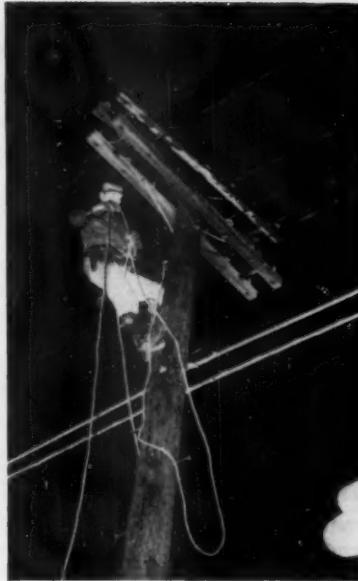
sonnel of outside contractors, and normal competitors freely swapped ideas and equipment to more effectively clear away wreckage, salvage materials and rehabilitate equipment.

To speed the work and to establish a fair price for indefinite repairs, most work was performed on a T and M basis, with general practice keeping repairs as minor as possible yet still safe, adequate and permanent.

Widespread cooperation also pertained to the supply of equipment and materials, with wire and cable, transformers, splicing sleeves and compounds, insulators, tape and other essential items coming from the ware-



BEFORE THE STORMS ABATED, service drops to residences were being repaired; 99 percent of all such jobs being completed within 2-day span.



DURING HOURS OF DARKNESS the work of rehabilitation continued, with contracting and utility linemen working in close cooperation.



JUNGLE OF BRANCHES hampered replacement of elevated cables and accessories by men who worked aloft on lift towers, boom buckets or ladders.

houses of manufacturers, wholesalers, utilities, contractors and motor shops alike.

Equipment and methods used in this gigantic restoration project varied widely, with men cutting tree trunks and branches with both hand saws and gasoline-powered chain saws; making elevated repairs atop ladders, hydraulically-operated boom-baskets and motorized pantograph platforms; erecting new line poles by manually-pulled ropes, truck derricks, gasoline or diesel-powered winches.

Motor-generator sets, quite understandably, were in high demand and every spare unit within a 500-mile radius was quickly located, allocated and dispatched to supply emergency power. Several electrical contractors with mobile m-g sets made repeated visits to hotels, restaurants and residences to "charge" refrigerators and deep freezers. Each charge lowered temperatures sufficiently to keep food from spoiling for several hours and, by repeatedly going "around in circles" from one customer to another, contractors kept tons of perishable food in edible condition until normal service was restored.

Ingenuity also showed up in such places as automobile service stations, where gasoline pumps (normally electrically operated) were kept in service by belt-coupling the pump sheaves to the pulleys of gasoline-driven lawn mowers—or even to the rear wheels of bicycles which were, in turn, rotated

by the usual sequence of sprocket chains, pedals, human legs and perspiration.

To expedite repair work, all trouble calls in the Boston area were routed to a central Edison clearing office. There calls were spotted on section maps, maps were then delivered to crews in the indicated areas and, when the crew was from another state and therefore unfamiliar with street names and locations, a local BEC man would personally accompany and direct the crew to the site of the call. In many cases (particularly when crews were familiar with the territory) work was further speeded through the use of radio-telephone equipment on service trucks, police or Civil Defense vehicles.

While all of this coordinated effort was being directed towards the restoration of exterior power lines, electrical contractors and plant maintenance men were also working 'round-the-clock inside industrial plants, commercial buildings and residences to clean and rehabilitate flooded equipment and switchgear. Here working conditions were equally severe, for basements were filled with mud and water (much of it being salt), and the lack of power necessitated installing temporary lighting or men worked by meager illumination of battery flashlights.

In this phase of the work, compressed air was used liberally for blowing out controls, busducts and conduit runs, after salt or brackish

water had been flushed away by fresh water under pressure. Carbon tetrachloride and various naptha products were also used for scrubbing busbars and other oil-gummed equipment. Temporary transformer banks and mobile m-g sets were connected wherever continuity of service was imperative (as in hospitals) and, when on-the-spot repairs could not be performed with certainty, submerged equipment such as meters, breakers, controls, starters and motors were removed for thorough cleaning and repair at shops equipped for that purpose.

In this endeavor, motor repair shops also made an important contribution, with NISA members, independents, manufacturers' shops and industrial maintenance departments all working to capacity.

For example, in the repair plant of one large motor manufacturer, picked crews of specialists worked in shifts steadily for 125 hours in a continuous assault on a huge backlog of damaged electrical apparatus. This 5-day maintenance marathon returned to service more than 50% of the total horsepower in units received; a total that included some 3000 pieces of damaged electrical apparatus with a combined rating of approximately 30,000-hp.

To supplement drying facilities, this same motor repair plant arranged with a shipbuilding yard at Quincy, Mass., for the use of a large annealing oven (17 feet wide, 20 feet in depth and height) to dry large equipment.

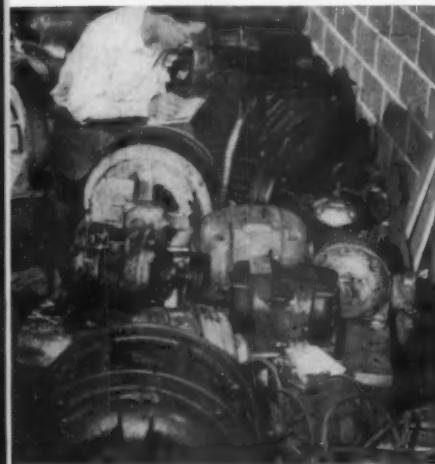
ELECTRICAL TEAMWORK (continued)



NEW POLES were erected alongside those splintered or felled by the storms, with derrick trucks, tubular braces and motorized winches assisting linemen.



WORKING ATOP NEW POLES, line crews shifted crossarms, hardware and wire from shattered supports. Despite prevalent hazards of working conditions, accidents to personnel were practically nonexistent. Working force for Boston area for the two storms included approximately 3000 men from other areas.



DAMAGED MOTORS by the thousands, many having been submerged by salt water, others gummed with oil and debris, clogged all types of repair shops.



UNLOADING MATERIAL from trucks of manufacturers and wholesalers, then reloading needed items into smaller vehicles for use by contractors, was frequently performed as a single, continuous operation at temporary outdoor supply centers. Most materials were installed on a T and M basis.

Paradoxically, this equipment had to be first resoaked in fresh water to dilute and wash away the coating of salt. To further eliminate reclamation bottlenecks this plant secured a second high-pressure industrial steam cleaner and arranged with a nearby laundry for a 24-hour supply of hot water and steam during the emergency. Steam and hot water lines were run from the laundry to a freight-car well at the shop which was converted pro tem to serve as an extra cleaning area.

In a further demonstration of teamwork, vital replacement parts were flown to this plant from as far away as Atlanta, Ga.

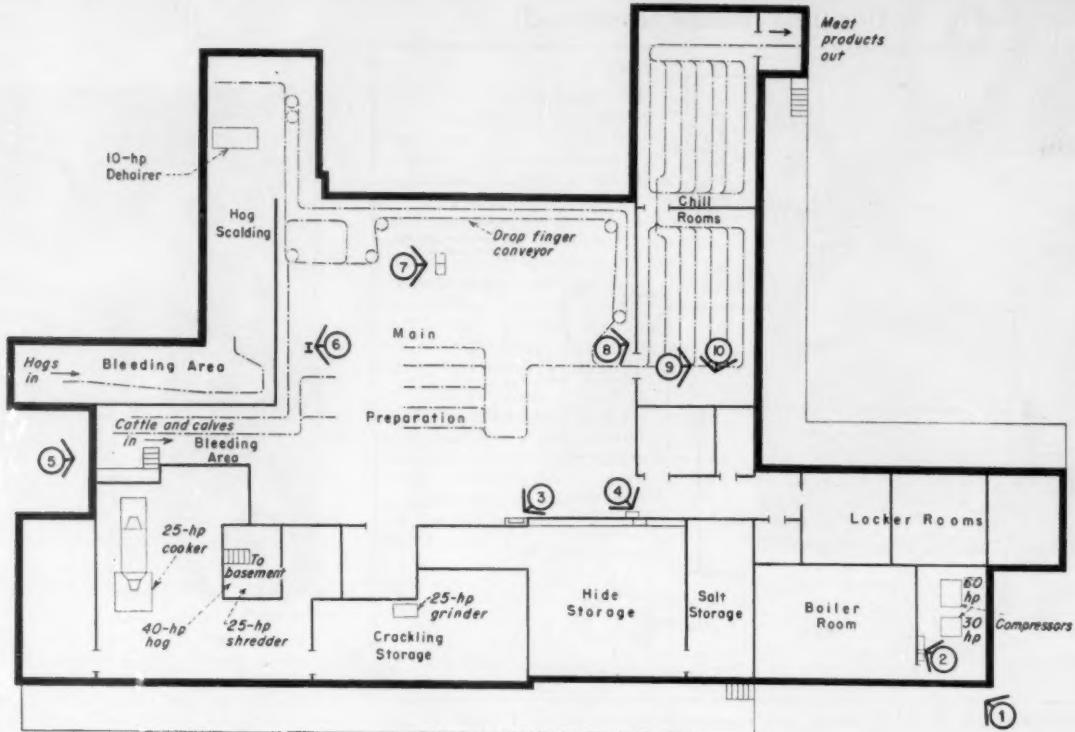
The service shop of another large motor manufacturer flew in more than 60 electric motor technicians from various branch shops in Chicago and Pittsburgh, then also went on a round-the-clock schedule to recondition over 2000 motors in a week's time.

In privately-owned and operated shops, motors were also processed by the hundreds. Initial cleaning was variously by steam, by boiling or by flushing with hot fresh water, or by spraying with carbon tet or naphtha products. To dry the motors, portable infrared lamps in hoods and oil or gas heaters supplemented conventional baking ovens. And, depending upon

Megger readings, length of time the units were submerged and similar factors, many motors were also re-insulated.

Since normal shop facilities were consistently overtaxed and overcrowded, extra space (for storage, cleaning and repair) was obtained by pressing into service alleys, yards and parking lots. Emergency shops were also set up in normal storage areas, corridors or industrial plants.

This industry-wide Operation Helping Hand was encouraging in its indications of efficiency, cooperation, unselfishness and downright neighborliness.



FLOOR PLAN of slaughter house shows layout of interior. Circled numbers indicate locations shown in photos.

Electrifying A Slaughter House

By Lee Harvill

Harvill-Byrd Electric Co.
Electrical Contractors and Engineers
Little Rock, Ark.

Extensive electrical distribution and circuiting vitalize operations at the recently completed, modern and scientific, one-level meat preparation plant of C. Finkbeiner, Inc., Capital Pride Meat Products, Little Rock, Ark.

A MODERN electrical system is today the backbone of operations at the new slaughter house of C. Finkbeiner, Inc., wholesale meat processors and packers, Little Rock, Ark. Here, cattle and hogs come in one side of the building and are processed in the scientific, electrified, production-line butchering operation; packaged meats go out the other side of the building at the truck-loading dock. Overall, electrical details in the plant include equipment installation and application techniques and methods used in wiring a modern meat processing plant.

Power is delivered to the building at 480 volts, 3-phase delta, from the secondary side of three single-phase

(3-phase, delta-connected) utility transformers. These units are mounted on a platform suspended between two poles in the yard alongside the building. Six 500MCM service conductors, two to each phase, are spliced to the 3-conductor service drop from the pole. From the large service head on the southeast corner of the building, the SE conductors come down inside the building in 5-inch conduit to a 600-amp, front operated, fused, 3-pole service switch in the compressor room in that corner of the building.

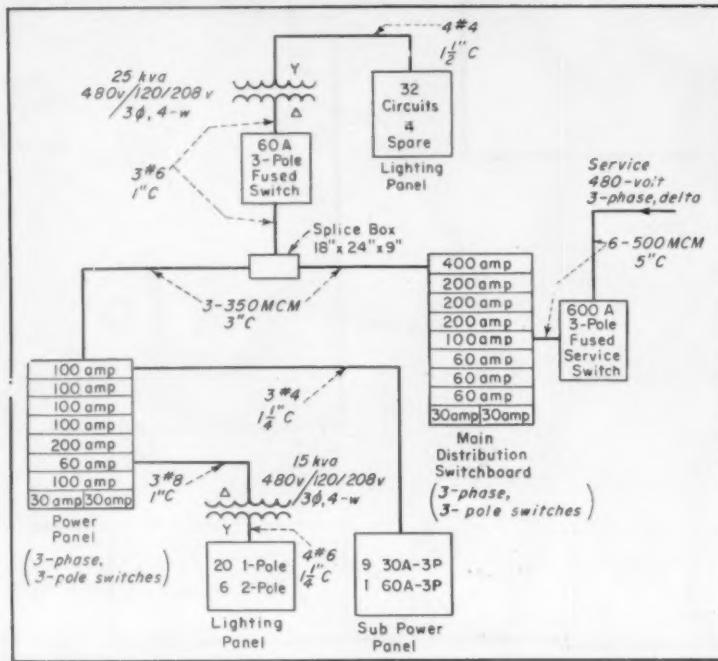
Distribution for light and power throughout the building is made at 480 volts, 3-phase, from a main switchboard alongside the service switch. From this board, 480-volt power is

carried to large motor loads directly and to power panels and lighting transformers in other parts of the building. Two lighting transformers—one 15 kva and one 25 kva—are connected 480 volts, 3-phase, 3-wire delta to 120/280 volts, 3-phase, 4-wire wye. Lighting and appliance branch circuits originate at two panels, one on the secondary side of each transformer. Layout of the distribution system is shown in the diagram.

The accompanying photos are numbered to correspond to numbers of various locations shown on the plan of the slaughter house.

Architects of this modern building were Ginocchio, Cromwell and Associates, Little Rock, Ark.

Electrifying A Slaughter House (continued)



DISTRIBUTION PLAN is simple and functional; carries 480-volt power to two lighting transformers in the building; feeds widespread motor loads from several panels in the building.



PHOTO 2. Service switch at left is 600-amp, 600-volt, 3-pole, fused, quick make and break, surface-mounted switch. Main distribution switchboard at right contains 3-phase feeder disconnects and protection. Switch at top of panel is 400-amp, fused unit. Other switches are fused, hinged-door, pull-out switching units. Compressors in the same room with this panel and certain pump and fan motor loads are fed directly from the panel.



PHOTO 3. Sub power panel, recessed in tile wall of main interior, is fed by 3 No. 4 conductors and contains 3-pole, fused, pull-out type disconnects for circuits to: three 5-hp hoists; three 3-hp hoists; a 2-hp tripe scalding; a 10-hp dehairer; a 1 1/2-hp booster pump; and a 1-hp saw. Larger individual motor loads—25-hp cooker, 40-hp hog, 25-hp shredder and 25-hp grinder—are fed directly from the power panel which supplies this sub panel.

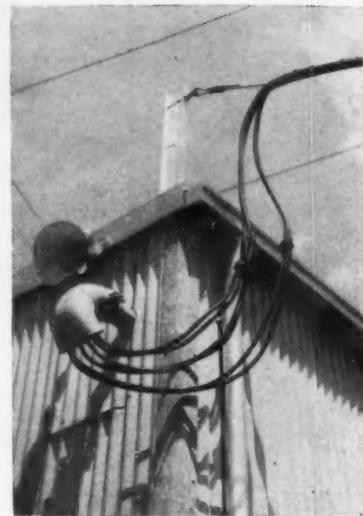


PHOTO 1. Service head at corner of the one-level plant couples to 5-inch conduit down to service switch inside. Self-supporting, aerial, 3-conductor service drop from outdoor pole mounted transformer bank splices to six 500 MCM conductors —2 per phase. Voltage of service is 480, 3-phase, delta.



PHOTO 4. Lighting transformer (top) and branch circuit panel are on clean tile wall of main interior. Transformer is 25 kva size, 480 delta primary to 120/208, 3-phase, 4-wire, wye secondary, fed through 60-amp, fused switch shown. Transformer is supported by rod hangers from the ceiling, with its back bottom edge resting on a length of angle iron which is bolted to the wall. It feeds the 4-wire tumbler switch and plug-fuse panel below.

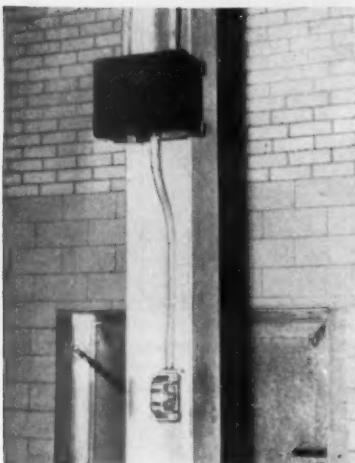


PHOTO 5. Electric prod (held here by "Bert" Steely, Chief Engineer for Harville-Byrd Electric Co.) is used to accelerate movement of animals through the chute shown here. Just on the other side of the door shown is the "knocking pen" and bleeding area where the processing operation starts. The prod gives the animal a shock when touched to its hide. As shown, a long power cord on the prod is supported by clamps on a messenger wire running the length of the chute. This cord attaches to a small, wall-mounted transformer plugged into receptacle.

PHOTO 6. Reversing starter and watertight, momentary-contact, up-and-down switch are shown here mounted on an I-beam column in the main interior. This equipment controls one of the 5-hp hoists used for lifting animal carcasses in the interior.

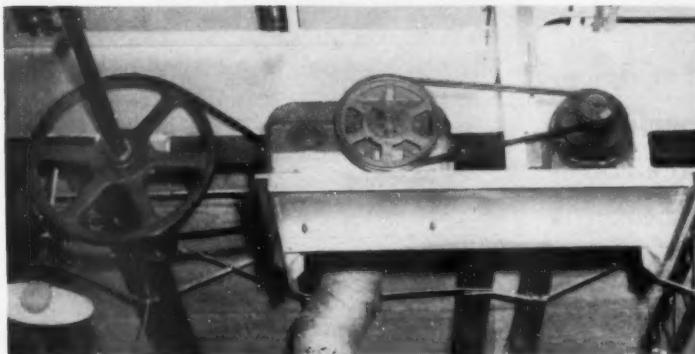
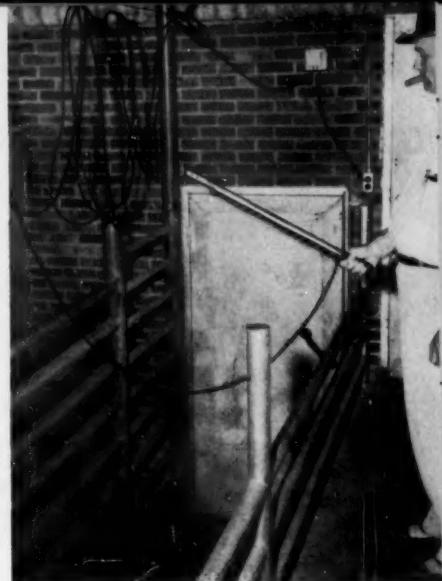


PHOTO 7. Motor (right) and gear box are mounted on a specially-made sheet steel platform which is suspended by angle iron sections from I-beams at the ceiling. Drive from the motor is reduced in speed and transmitted to the wheel on drive shaft which powers a drop finger conveyor for transporting meat.

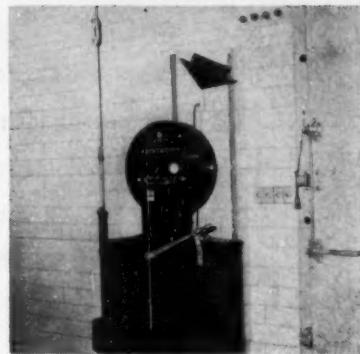


PHOTO 8. Electric scale is shown here just outside the chill room. Scale is plugged into surface-mounted duplex receptacle on wall (arrow). Four single-pole weatherproof switches are at right of scale for controlling lights in chill rooms. Four red signal lights, above the switches, indicate when the lights are "on."

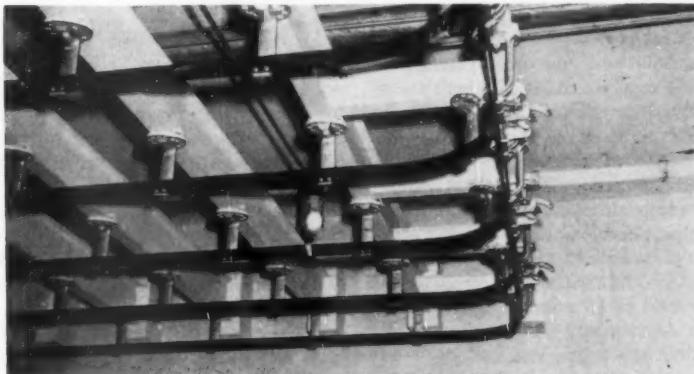


PHOTO 9. Each of two chill rooms is lighted by eight incandescent lamps spaced around the ceiling among conveyor rails. Each lamp is housed in a weathertight, clear glass enclosing fixture, mounted on the ceiling and fed by rigid conduit.

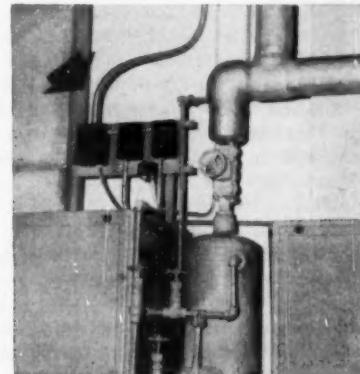


PHOTO 10. Refrigeration motor controllers and thermostatic controls (arrow) are mounted on a plate supported by channel iron pieces close to the wall at one end of the chill room. Refrigeration equipment and piping are shown here. Two blower units (right and left) are powered at 480 volts.

**Customer Service
Assured By**

New Shop Techniques

Use of proper machines and equipment and of production line techniques in handling repairs of motors and electrical equipment keeps shop efficiency high, and promotes better customer service for Southern Electric Co., Inc., Charlotte, N. C.

THE Southern Electric Service Co., Inc., Charlotte, N. C., believes in giving its customers the best service possible at the lowest price possible. In order to do this, it has designed and installed a well-planned shop layout with an engineered production line routine that allows for specialization and maintains a high efficiency in its motor repair and overhaul shop. Equipment has been installed which enables them to do a better and quicker job, and a production line procedure that keeps jobs rolling through the shop on a scheduled basis has been put into effect.

The company has departmentalized its operations to achieve maximum efficiency. Small motor repairs are handled exclusively in one department, which is one of the largest such operations in the South. Large motors and equipment are handled in another de-

partment. An industrial sales division operates as a separate unit and contacts industrial and other plants over a wide area, which benefits both repair departments as well as the sales department.

In addition to acting as an authorized service center for several electrical equipment manufacturers, Southern Electric Service Co. also acts as a service center for electrical appliance distributors and dealers.

A total of 16 salesmen make up the sales department. These salesmen, including five from the Charlotte office, regularly cover the Piedmont area of North and South Carolina, the Ohio River area, the entire deep South, and New England.

Because of its wide activities, the company stocks a complete inventory of all sizes of motors, even those large ones for textile mills, saw and grain

mills, cotton gins and other types of industrial plants which are common in the South. It carries in inventory a good stock of materials and equipment for a complete internal electrical distribution system and lighting installation. There are 2700 items of single phase alone carried in stock.

Complete service can be given the customer, even on heavy electrical installations, because the company maintains its own electrical contracting division.

Such wide contacts of necessity bring in a lot of business for the motor repair and overhaul shops. It is not unusual to receive emergency calls to make repairs so that an industrial plant operation can be resumed with the least delay.

It is in such emergency cases that Southern Electric Service's production line technique and the specialists



FILE CARDS are maintained on each motor repaired. All technical and shop data necessary for overhaul and repair are recorded.



SMALL MOTORS are all disassembled on this bench, and all parts for each motor are placed in separate tray. Inspection follows, then shop tickets are written describing repairs and parts needed.



ROUND aluminum forms are placed on coil winder by motor shop superintendent H. S. Furman, who designed them. These rounded ends are more satisfactory than diamond shape.



BICYCLE SEAT mounted on swivel stand provides comfortable seat and prop and allows for more freedom of foot action to operate controls on the coil winding machine.



SHOP-MADE STAND used to hold coils during hand taping is more efficient than other usual methods. Jaws are foot-operated, kept tight by rod which extends down through stand to foot pedal.



PUNCH PRESS of 4-ton capacity has been converted to straighten rotor bars, also to punch out copper connection clips and paper press board washers.



CLEANING VAT has exhaust fan mounted in metal hood to remove cleaning fluid fumes and keep them from circulating throughout the shop area.



SANDBLASTING is used to remove dirt from motor housings and other parts to restore to original condition. It does a clean job that promotes satisfaction.

show up to best advantage. It is in such instances that the wide range of equipment can be coordinated to do the emergency job without too much interference with normal production routine. Also there is a lot of special equipment which the shop has designed to lower operating costs and at the same time speed production. These things make work easier and less laborious.

All single phase motors are disassembled on the production line, inspected, and needed repairs and part replacements determined. All parts and housings are kept together on trays while going through cleaning and refinishing. The trays then go to specialists for each type motor for assembly and adjustment. This method has speeded work.

Southern Electric Service has developed several shop-made tools and

pieces of equipment to make work easier and to increase shop efficiency.

In the coil winding department, Superintendent H. S. Furman has designed a method of making round end aluminum metal forms to go on the winding head to adjust to slot length. Scrap aluminum is cast in the shop, the form then machined smooth and slots cut to size. A total of 24 such forms have been made ranging from 1½-inch to 6½-inch coil width.

Advantage of the round form over the diamond shape is a saving in wire. For a ½ hp ac motor the shop saves one pound of wire, and proportionately on other size motors. Another advantage is that if the shield is close, the round ends will stay compact and not touch it. This has eliminated trouble on two-pole motors. Knuckles are used in the ends of the coil where No. 15 (.057cm) or larger wire is used.

Instead of the conventional chair or stool at the coil winder, the shop has installed a bicycle seat which allows more freedom of foot action on the controls. A punch press has been converted to a hammer press by installing heads to straighten rotor bars.

Charles Morris, in charge of the single phase motor shop, rigged up a bake oven to give better performance and even temperature throughout the entire oven. This was done by installation of low surface temperature Chromalox units, each of 667 watts. There are three sets of six units fashioned to provide 3600 watts hooked up three-phase delta to operate the oven at 270 deg. F.

The company encourages everyone in the shop to present new ideas for doing a job better or easier. As the ideas are developed they are put into effect to improve shop procedure.

Selenium Power Rectifiers

For dc power requirements the selenium rectifier provides a compact and highly efficient source. The author gives basic data on the construction and circuitry of typical equipments used in industrial applications.

By **Samuel Heller, P. E.**,

*Chief Engineer,
American Rectifier Corp.,
New York, N. Y.*

SELENIUM power rectifiers are used widely to provide direct current from alternating current sources for industrial dc requirements. Static operation, high efficiency, simplicity of construction and assembly and long service life are some of the merits of modern equipment. An understanding of basic characteristics and typical constructions is helpful in the selection and use of apparatus for particular applications.

These components are common to most selenium rectifier units:

1. The rectifying stacks, of which there may be 1, 2, 3 or more.

2. The transformer or transformers, either auto, two-winding or tapped—as many as six or more in a single unit.

3. Fuses or primary protection such as a magnetic thermal overload starter with pushbutton or a circuit breaker.

4. Auxiliary control element—magnetic amplifier, saturable reactor or variable voltage transformer.

5. A fan of proper size, if fan cooling is used.

6. Panel devices—meters, rotary controls, switches, pilot lights and terminals.

7. The steel enclosure which houses the components.

Rectifier stacks

A rectifier "stack" is the name given to an assembly of rectifier *cells*. The cells are arranged in series to get a voltage rating equal to the input ac volts; they are arranged in parallel to get sufficient ampere output. Size and number of cells required to make up a rectifier stack depend upon the limiting properties of a cell:

1. The number of rms volts a cell will rectify.

2. The number of amperes a cell can safely carry as a rectified load.

There is a third factor which must sometimes be considered. This is the dc blocking voltage—the maximum dc voltage that can safely be applied in the direction opposite to that of current flow.

The number of rms volts a cell will safely rectify is the maximum ac voltage rating of the cell as specified by the manufacturer. Depending upon this rating and the ac voltage to be rectified, a number of cells can be used in series to provide rectification.

The number of amperes a cell can

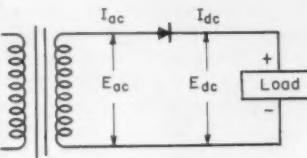
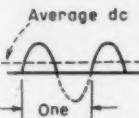
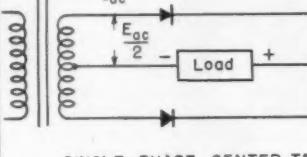
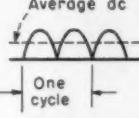
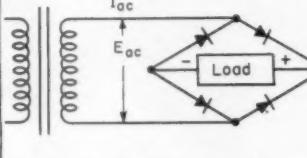
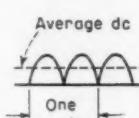
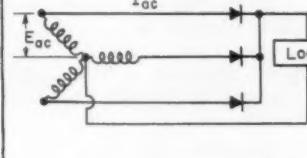
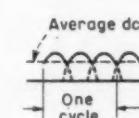
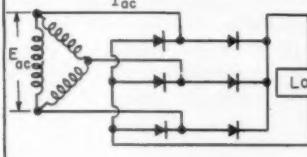
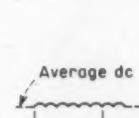
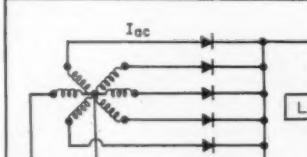
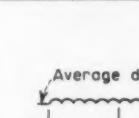
carry is also specified by the manufacturer with certain limitations. A selenium cell is all conductive, that is, the entire selenium layer takes part in the rectifying action. As a result, the number of amperes a cell can carry depends upon the square-inch area of the cell. Ampere rating varies from 300 milliamps (0.3 amps) per square inch to 1 ampere per square inch, depending upon the voltage of the plate and the type of cooling used.

A typical stack is assembled for a particular application as follows:

Assume a single-phase input of 120 volts ac is to be applied to a stack. If 40-volt cells are used, at least three cells in series are needed. For a single-phase bridge-connected stack, there would be four such arms (of 3 cells each)—a total of 12 cells. If 8-amp cells are used, an output of about 90 volts, 8 amps dc would result. For 16-amps output, 2 cells in parallel must be used in place of each single cell—a total of 24 cells in all for the bridge.

Various Circuits

There are various ways of hooking up cells or stacks to provide a rectifying circuit. Each type of rectifier

Rectifier Circuit Type	Rectified Wave	Remarks
 <p>SINGLE-PHASE, HALF-WAVE</p>	 <p>Average dc One cycle RIPPLE = 121%</p>	<p>$E_{dc} = 2.3 E_{ac} + VD$ $I_{ac} = 1.8 I_{dc}$ Ripple freq. = F</p> <p>This is the simplest rectifier circuit and is suitable only for low power applications. As shown by the rectified wave, current flows only during half of each cycle; the circuit is effectively open during the other half cycle. A capacitor or filter network is often used with this circuit to boost the dc voltage. The circuit has poor efficiency, and is seldom used for industrial purposes due to the appreciable fluctuation or ripple in the dc voltage level.</p>
 <p>SINGLE-PHASE, CENTER TAP</p>	 <p>Average dc One cycle RIPPLE = 48%</p>	<p>$E_{dc} = \frac{1.15}{2} E_{ac} + VD$ $I_{ac} = 0.8 I_{dc}$ Ripple freq. = $2F$</p> <p>The single-phase center tap rectifier circuit gives full-wave rectification with a minimum number of cells and an output ripple of twice the supply frequency. The circuit uses both halves of the ac cycle and requires a center tapped transformer. The arrangement is particularly economical and advantageous for low voltage, high current applications. The ripple voltage is considerably improved over the half-wave case; a steadier, higher dc voltage level is the result.</p>
 <p>SINGLE-PHASE, BRIDGE</p>	 <p>Average dc One cycle RIPPLE = 48%</p>	<p>$E_{dc} = 1.15 E_{ac} + VD$ $I_{ac} = 1.15 I_{dc}$ Ripple freq. = $2F$</p> <p>Passing both halves of the ac input cycle, this circuit also provides full-wave rectification, but requires only a simple transformer. The stacks can be arranged in series and/or parallel hookups of cells to provide a wide range of specific current requirements and output voltages. Again ripple voltage is lower than in the half-wave circuit and efficiency is higher.</p>
 <p>THREE-PHASE, HALF-WAVE</p>	 <p>Average dc One cycle RIPPLE = 18%</p>	<p>$E_{dc} = .86 E_{ac} + VD$ $I_{ac} = .65 I_{dc}$ Ripple freq. = $3F$</p> <p>This circuit is equivalent to three single-phase, half-wave circuits with overlapping of their rectified half cycles so that current flows throughout the cycle. Efficiency of this hookup is higher than the efficiencies of single-phase circuits and the ripple voltage is a smaller percent of the average dc voltage. Filtering of the ripple is more easily accomplished due to the higher frequency of the ripple. Three-phase, half-wave circuits are used for low voltage electrochemical rectifier applications.</p>
 <p>THREE-PHASE, BRIDGE</p>	 <p>Average dc One cycle RIPPLE = 4%</p>	<p>$E_{dc} = .74 E_{ac} + VD$ $I_{ac} = .85 I_{dc}$ Ripple freq. = $6F$</p> <p>The three-phase, full-wave bridge is the equivalent of the electronic six-phase unit. The ripple voltage is very low, and because its frequency is so high (six times the frequency of the ac input) it is easy to reduce the ripple to a negligible amount by proper filter networks. The dc output voltage is equal to or higher than the rms value of the ac input voltage. This high-efficiency circuit is the most advantageous and economical for high-voltage applications (220 or 440 volts dc output).</p>
 <p>THREE-PHASE, CENTER TAP</p>	 <p>Average dc One cycle RIPPLE = 4%</p>	<p>$E_{dc} = \frac{.74}{2} E_{ac} + VD$ $I_{ac} = .46 I_{dc}$ Ripple freq. = $6F$</p> <p>The three-phase, full-wave center tap circuit economically offers very high efficiency and low ripple voltage for very low-voltage, heavy-current dc applications. As shown, a center tap to each phase winding of the transformer secondary is necessary. The center taps are made common and carried to the negative side of the load. Each end of each phase winding is carried through selenium cells to the positive side of the load.</p>

E_{ac} = ac input volts (rms)

E_{dc} = ave. dc output volts

VD = voltage drop in rectifier (rms)

I_{ac} = ac current (rms)

F = frequency of ac input

I_{dc} = ave. dc output current

$\% \text{ Ripple} = \frac{\text{rms ac component of output volts}}{\text{ave. dc output volts}}$

Note:  is the symbol for a selenium cell or stack. Arrowhead points in the direction of current flow

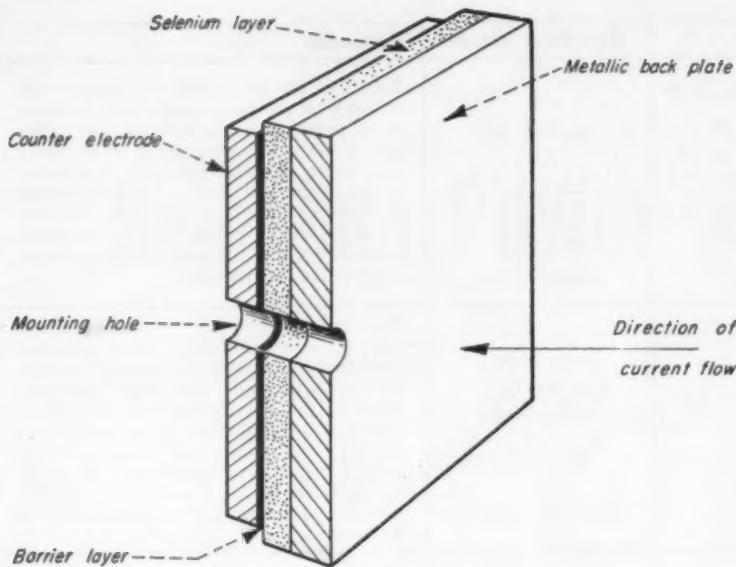
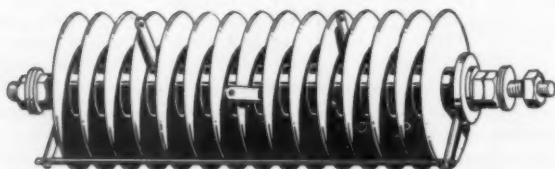
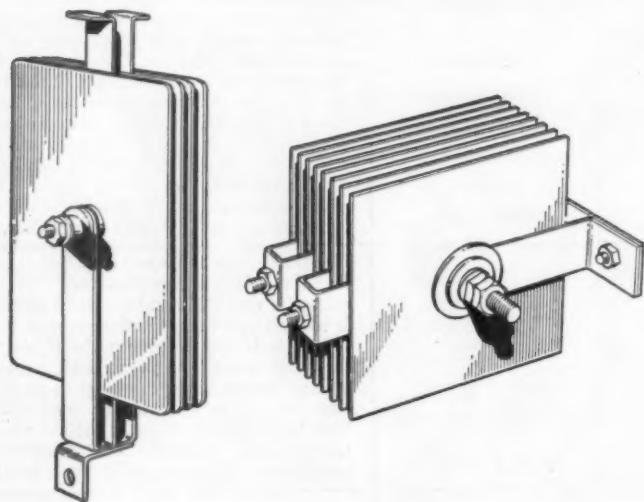


FIG. 1 CROSS SECTION OF SELENIUM CELL



TYPICAL RECTIFIER STACKS
Series and parallel hookups of cells

circuit has its own particular characteristics and advantages. Types of circuits are shown in Table 1. Besides the relative efficiencies (and voltage and current characteristics) of the different circuits, ripple voltage is often an important consideration in selecting a particular circuit. Ripple voltage is a regular fluctuation of the dc output of the rectifier and is equivalent to an ac voltage superimposed on the dc output voltage. Depending upon the circuit used, ripple voltage may have a frequency equal to one, two, three or six times the frequency of the ac input voltage. Selection of basic cell sizes and the use of cells or stacks in series, parallel or series-parallel, are considerations apart from the circuit hookup of the rectifier.

A selenium rectifier cell consists of a thin layer of pure metallic selenium sandwiched between two metallic plates, Fig. 1. Each of the plates is an electrode—one is called the back plate and is made of steel or aluminum; the other is a layer of a low resistance alloy. The assembly is so made and chemically bonded as to provide uniform current-conductive characteristics through the entire area of the selenium.

Operating characteristics of the basic cell derive from the uni-directional conductivity of the selenium layer—a natural rectifier. Current will readily flow through the cell from the back plate to the alloy layer; but practically no current can flow through the cell in the reverse direction. As a result, if alternating-current voltage (up to about 1000 cps) is applied across the cell, current will flow in the circuit in one direction, only during one half of each alternating cycle. Current in the circuit is therefore dc.

The history of selenium as a rectifier dates back to 1883. However, its main use for many years thereafter was in photovoltaic applications — when a selenium coated plate is exposed to sunlight, a current will flow from the cell through an external circuit.

The first commercial use of selenium as a rectifier occurred in Europe about 1924. About ten years later, it was introduced into the United States. In the late 1920's, copper oxide rectifiers were first made; development of other contact type rectifiers—copper sulphide, magnesium sulphide and germanium—soon followed.

The discussion here concerns only industrial type selenium rectifiers and not the type used in radio and electronics. Industrial type selenium rectifiers have a life from 50,000 to 60,000 hours under full load conditions.

take
guesswork
out of
wiring
with
wire

mike

read WIRE, PIPE
or CONDUIT size
at a glance



It's good business to connect with

BURNDY

54-19

... FIRST name in electrical connectors; tools; methods

In Every Home

the trend is

to Quiet



and the

NEW



Junior
Quiette
LIGHT SWITCH

Don't follow the trend toward quiet and QUIETTE SWITCHES . . . LEAD THE WAY!

Recommend that home owners and prospective home owners select the ARROW-HART JUNIOR QUIETTE SWITCH for every room of the homes they own or plan to own.

Here's a light switch that whispers **quality** so quietly you'll have to tell your customers and prospects about it . . . they won't hear it! But they'll appreciate the quiet and the quality and be **completely** satisfied. This will mean **no** unprofitable call-backs but plenty of profitable

new installations through favorable word-of-mouth advertising. Recommendations pave the way to profits!

The desire for quiet . . . and QUIETTE SWITCHES . . . in the home is there. Cash in on it! Sell **quiet**. Sell **quality**. Install ARROW-HART JUNIOR QUIETTE SWITCHES because they . . . along with the other A-H QUIETTE Switches, Lifetime and Interchangeable . . . offer the most perfect combination of quiet and quality available in the electrical industry!

SPECIAL FEATURES OF THE *Junior Quiette*
LIGHT SWITCH HAVE WIDE APPEAL

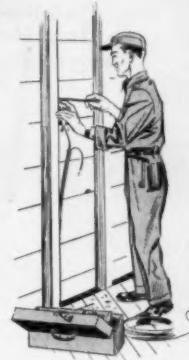


FOR THE USER

- Quiet, safe mechanical operation of incandescent and fluorescent lights and appliances without mercury.
- Special new PLATEAU HANDLE DESIGN that keeps out dust, permits the switch to fit snugly, neatly into any Uniline or metal wallplate.
- Continuous operation in any position.
- Brown or Ivorilite operating handle that complements any decorative scheme.

FOR THE INSTALLER

- Screwless WIRE-LOCK Terminals that make installation easier, faster.
- Ground Feed Thru Shunt (in single pole models) eliminates splicing, taping or soldering jobs . . . and extra wires.
- Positive electrical connection and strong mechanical connection.
- Release Slot that permits release of wires simply by insertion of blade of small screw driver or "Key to Profit."



SINGLE POLE SWITCH
CATALOG NO. Q-1
only 80¢ LIST



SINGLE OR DOUBLE POLE,
3-WAY OR 4-WAY . . . 15
AMPERES, 120 VOLTS A C ONLY
. . . LISTED AS STANDARD BY
UNDERWRITERS' LABORATORIES.

Provide YOUR CUSTOMERS WITH MORE THAN ADEQUATE WIRING . . .
MORE THAN ADEQUATE WIRING DEVICES.

It's not enough to provide your customers with a sufficient quantity of wiring devices. Quality's a "must" tool. Assure them of all the benefits of modern electrical living . . . comfort . . . convenience . . . safety . . . for years to come through the wiring devices you install today, by installing ARROW-HART.

Arrow-Hart's record of 335 outstanding new developments during the past 24 months is your guarantee that TODAY'S INSTALLATIONS will provide for TOMORROW'S NEEDS!

Buying ARROW-HART means getting prompt delivery from a nearby source . . . because Arrow-Hart serves you through leading electrical distributors of wiring devices.

Send for FREE FOLDERS THAT GIVE SPECIFICATION, INSTALLATION AND ORDERING INFORMATION

Mail the coupon below for two free folders (one a pocket-size folder for handy on-the-job reference) that give full specification, installation and ordering information on the complete A-H line of quality QUIETTE SWITCHES.



ARROW-HART

SINCE 1890

Quality Wiring Devices

MOTOR CONTROLS

ENCLOSED SWITCHES • APPLIANCE SWITCHES
THE ARROW-HART & HEGEMAN ELECTRIC CO.
HARTFORD 6, CONNECTICUT



WIRING DEVICE DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO.
103 Hawthorn Street, Hartford 6, Connecticut

Please send me QUIETTE Switch Folders.

NAME _____

POSITION _____

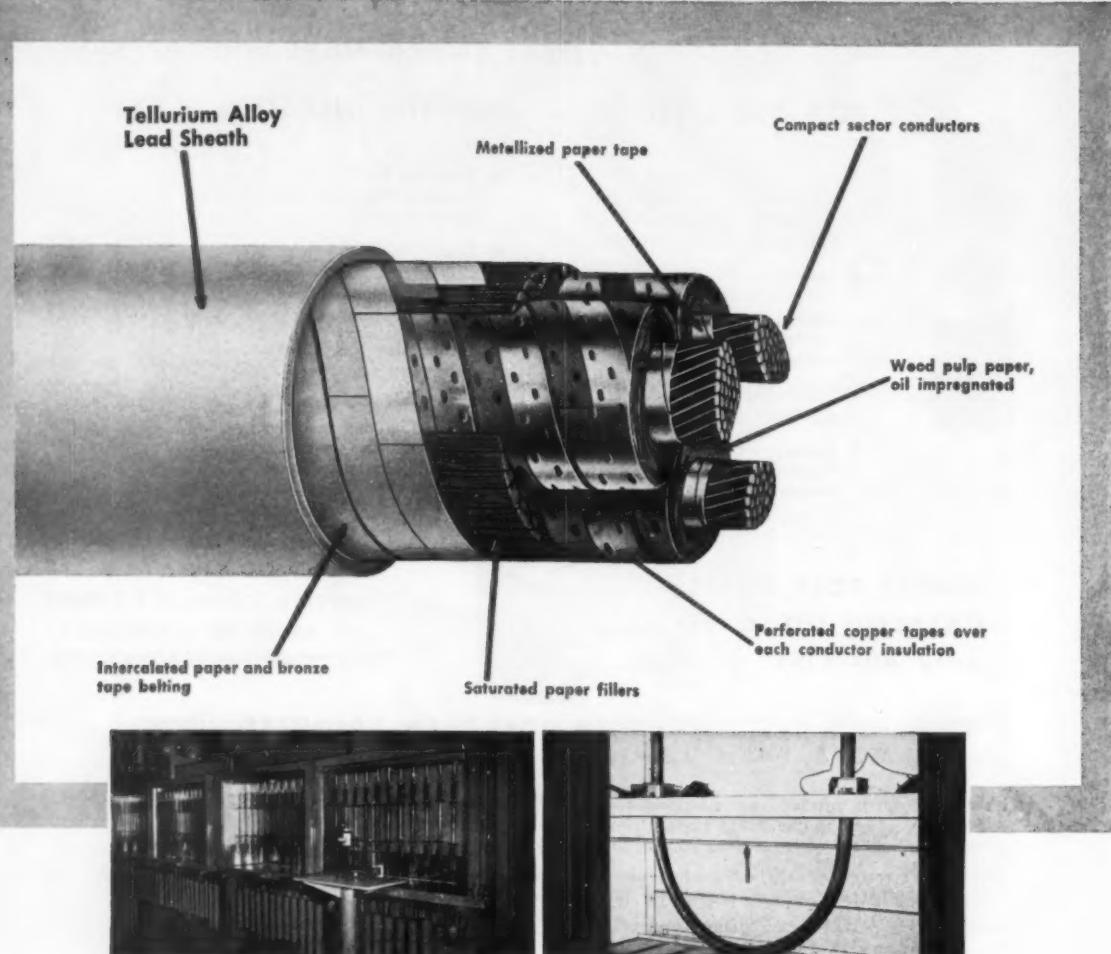
CO. NAME _____

CO. ADDRESS _____

CITY _____ ZONE _____ STATE _____

ECM

FOR INCREASED LOAD REQUIREMENTS...PAPER INSULATED CABLE WITH TELLURIUM ALLOY LEAD SHEATH



Some of the specially-developed testing equipment with which Roebling maintains quality control of the production of Tellurium Alloy Lead Sheath. #1 Temperature control ovens for creep test of strips cut from tellurium alloy lead cable sheathing. #2 Temperature control oven for bending fatigue test of full cable section.

YOU'LL REALLY solve power cable headaches with Roebling Paper Insulated Cable with the new Tellurium Alloy Lead Sheath*, a Roebling exclusive. Here are some of its outstanding advantages:

- 1—Tellurium Alloy Lead Sheathed Cable has a lower long-time creep rate;
- 2—Extra high fatigue resistance;
- 3—High bursting strength;
- 4—Exceptional stability under heat application as in duct splicing and wiping;

- 5—Abolishes need for frequent stop joints or reinforced lead sheath;
- 6—Doesn't require generous expansion bends or large manholes;
- 7—Heat application in splicing leaves its desirable properties unimpaired.

WRITE US FOR FULL DATA. John A. Roebling's Sons Corporation, Dept. 707, Trenton 2, N. J.



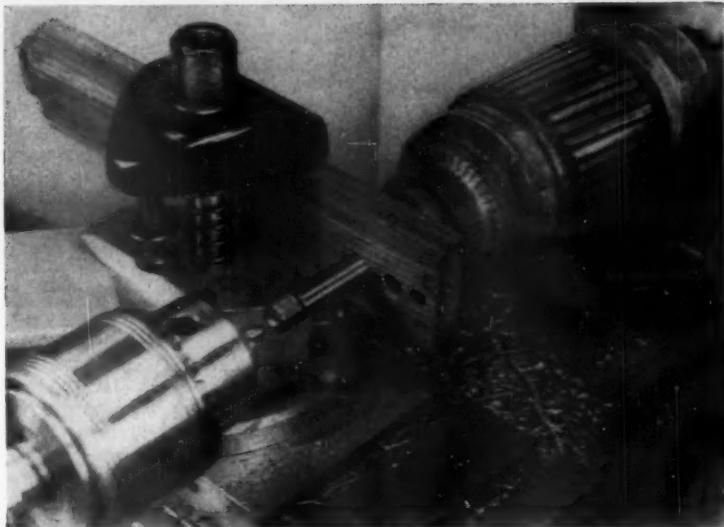
ROEBLING



SUBSIDIARY OF THE COLORADO FUEL AND IRON CORPORATION

BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. & S PITTSBURGH ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3288 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HOTS. BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6316 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1930 E. 3RD ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, ROOM 239, HENRY W. OLIVER BLDG. • ROCHESTER, 1 FLINT ST. • ST. LOUIS, 2001 DELMAR BLVD. • SALT LAKE CITY, 526 W. 5TH SOUTH STREET • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

Motor Shops



Lathe Rest for Truing-up Rotor Shaft

A method of truing-up the centers in the ends of rotor shafts has been reported by Clifford T. Bower, London, England. Before re-skimming the commutator of an electric motor which has to be overhauled, it is usual to true-up rotor shaft centers. This is usually done in a lathe by gripping one end of the rotor in a true chuck and supporting the other end in a three-point fixed steady. The average lathe steady rest is a cumbersome object to mount on the lathe and usually requires a lot of time to be spent on setting it up.

A steady rest which requires no setting and can be mounted in the lathe as easily as an ordinary turning tool is shown in the photo. It comprises a length of hard-wood through which are bored holes of varying diameters which are close fit for various rotor shaft sizes. The holes are put through the steady rest by gripping a suitably sized drill in the lathe head-stock chuck and feeding the piece of hard-wood to the drill by means of the longitudinal saddle feed. It is easy to see that if the piece of hardwood is mounted in the lathe tool-post with the same face downward each time, the drilled holes will be automatically on the center line of the lathe in the horizontal plane.

To re-center the ends of a rotor shaft, grip one end of the shaft in the lathe head-stock chuck in the usual manner, mount the wooden steady rest in the lathe tool-post and engage the

other end of the rotor shaft with one of the holes which is of a suitable size. The center can be aligned in the horizontal plane with the center drill held in the tail-stock chuck by adjustments of the cross slide. The steady rest can be arranged to engage with the actual bearing portion of the rotor shaft so that even if the shaft should be slightly bent, the commutator, when machined on the new centers, will run truly.

One of the best methods of cleaning up an old center hole and retrueing it is to use a combination center drill from which the small-diameter tip has been broken off. There are usually plenty of these available in the average maintenance shop, and they are much better because they will true-up the center hole without following the eccentric run of the old one.

Combined De-Reeler and Wire Storage Table

Magnet wire pay-out and storage facilities for 18 reels are combined in a single twin-deck table arrangement in one corner of Phoenix Electric Company's motor repair shop in Mansfield, Ohio. Ready for immediate de-reeling at all times are eight reels on the table top and eight reels on the floor underneath. Two small spools are mounted to a special attachment at the front end of the table. The reels comprise an assort-

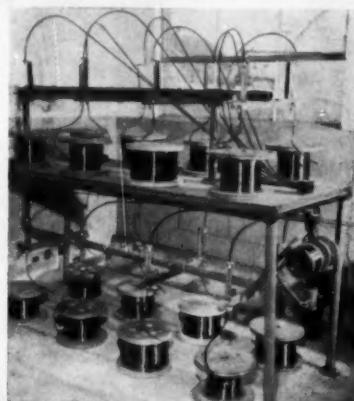
ment of wire sizes used most frequently in the shop.

A heavy rectangular frame of 2-in. pipe supports a sturdy $\frac{3}{4}$ -in. plywood table top about 39 inches above floor level. Flanges on the pipe legs securely anchor the unit to the concrete floor. The 8-in. to 12-in. diameter magnet wire reels are placed on their sides on both table and floor.

De-reeling facilities are provided by $1\frac{1}{2}$ -in. angle-iron arms (each 24 inches long) and $\frac{1}{2}$ -inch diameter steel tubing which guides the wire from each reel to a common terminal block at the table's edge. Four bracket arms are U-bolted at right angles to a long pipe support centered about 18 inches above the table top. Each arm serves two wire reels. A duplicate setup is added under the table for the reels on the floor.

Flat-iron uprights (each 7 inches high) welded to each end of the supporting cross arm hold one end of the wireguide tube which is capped with a plastic bushing. These stationary tubes are formed with a wide sweep ell and angle down to the common terminal block where the wire emerges in front of the coil winding machine.

Mounted to each end of the cross arm, and directly below the guide tube are small pillow blocks housing ball bearings. Each bearing supports an 18-in. length of $\frac{1}{2}$ -in. tubing shaped like a splayed hook and capped at the free end with a plastic bushing. Bearings are kept in position by a $\frac{1}{2}$ -in. Allen set screw in a tapped hole in each pillow block. The set screw contacts



TWIN-DECK DE-REELER table at Phoenix Electric Co., keeps 18 reels of magnet wire ready for immediate snag-free pay-out to winding head. Variety of wire sizes include those used most frequently in the shop.

FULLMAN

Latrobe

Electrical Products

*Floor Boxes
and Wiring
Specialties*

ADJUSTABLE
WATERTIGHT
FLOOR BOXES

NON-ADJUSTABLE
WATERTIGHT
FLOOR BOXES

ADJUSTABLE
GANG FLOOR BOXES
1-2-3 AND 4

FLOOR JUNCTION
BOXES

Quickly Installed Efficient in Operation

There is nothing complex or intricate about "Latrobe" Floor Boxes and Wiring Specialties. Their design and mechanism is kept simple and sure. That is why "Latrobe" products are so quick to install and so trouble-free in operation.



Two Gang Adjustable
Floor Box

Adjustable Boxes come in single-round or square bodies. Also in square type Single Gang, Two Gang, Three Gang and Four Gang Boxes



"BULL DOG"
PIPE OR CONDUIT HANGER

Sturdy and dependable for hanging pipe to conduit $\frac{1}{2}$ ", $\frac{3}{4}$ ", and 1" to steel beams up to $\frac{3}{8}$ " thick. Larger sizes for larger pipe.

Sold only thru Wholesalers
Write for illustrated Catalog



UTILITY OUTLETS

• NOZZLES AND
FLOOR BOX
ACCESSORIES

• INSULATOR
SUPPORTS

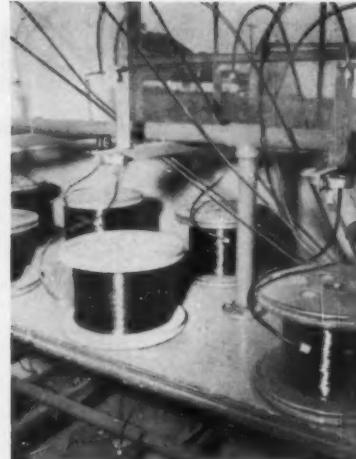
• PIPE AND CONDUIT
HANGERS

• ARMORED
CABLE SUPPORTS

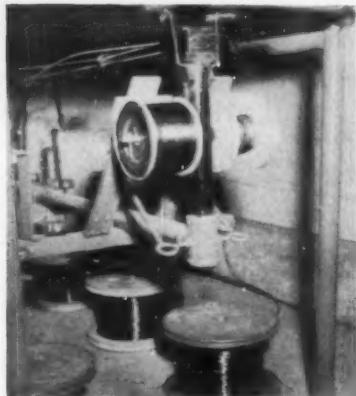
• CABLE CLIPS

• STAPLES

• FISH WIRE



SNAG-FREE pay-out is provided by a bearing-mounted, splayed, hook-shaped tube which rotates counterclockwise around reel as wire is drawn. Note numbered tab above reel denoting wire size.



SMALL WIRE spools are mounted to bracket support under table. Tension is provided by spring-actuated wood block brakes which contact spool edges. Terminal block shown above is for guide tubes leading to larger reels on floor.

a small flat area ground on the outer bearing race.

Wire from the reel is threaded through the rotating tube section, up through the stationary guide tube and out onto the winding head. As the magnet wire winds around the coil form, the hook-shaped tube rotates counterclockwise around the reel and pays out the wire without danger of snagging or kinking.

Conventional tension blocks at the winding machine are used with this de-reeler. If additional tension is desired, an ordinary spring-type paper holder with felt lining is placed around the rotating tube and clamped to a light metal bracket extension at the pillow block. This slows the rotational speed of the de-reeler tube. Tension for the small spools at the front of the table is provided by spring-actuated

Fullman Manufacturing Co.

1209-1215 JEFFERSON STREET

LATROBE, PA.



TELEPHONE SWITCHBOARDS



FIRETOWERS AND CORRIDORS



DISPENSARIES



CONTROLS

NOW! Hundreds of profit-making spots for you to sell new **Exide® LIGHTGUARDS®!**

Wherever people gather, there's need for Exide Lightguard protection . . . in stores, restaurants, theaters, hotels, churches, banks, office buildings, police stations, schools. Some industrial plants use as many as 200. The following spots need dependable, emergency lighting protection: sales floors, cashier's cages, open counter displays, corridors, aisles, dining rooms, lobbies, boiler rooms, engine rooms, switchboard rooms, loading platforms, vaults, exits, firetowers. They are all spots where you can profit by selling Exide Lightguard units.

The new Exide Lightguard unit lights up instantly and automatically whenever the normal electrical supply is interrupted by storms, floods, accidents, fires or other causes beyond the control of the ever-vigilant utility companies. When lights go out, Lightguards go on. They safeguard customers and employees against injuries; they minimize property damage, pilferage, and enable control of vital processes to be maintained.

WRITE NOW FOR FULL DETAILS

Let's see how the new Model M Exide Lightguard gives you big sales advantages. The Model M has a two-rate charger—*high rate* or *trickle*. After the emergency, the high rate charger restores the Exide battery which was specially built for emergency lighting use. This Exide

battery assures dependable, trouble-free operation, long life, easy maintenance. All Exide Lightguards are UL-approved and can be plugged into any 115 volt outlet. They operate instantly—each lamp illuminating up to 10,000 sq. ft. There is up to 8 hours of continuous emergency lighting protection in the standard one-lamp unit!

If you are an electrical contractor or electrical equipment dealer, cash in today on an expanding market by selling new Model M Exide Lightguards. Get all the facts now. Sell the best available unit—one that will keep your customers satisfied. Fill out the coupon and send it to us today!



MAIL THIS COUPON NOW!

Exide INDUSTRIAL DIVISION

The Electric Storage Battery Company

Philadelphia 2, Pa.

Sure . . . I want to cash in on emergency lighting. Rush details on the new Exide LIGHTGUARD units.

Name _____

Address _____

State _____

City _____

My business is

Electrical Contractor Consulting Engineer
 Architect Distributor Dealer Electrical Engineer Other

The CLARK Line now includes SERVICE ENTRANCE EQUIPMENT



- General Purpose Switches
- Fuse Pullout Service Entrance Switches
- Fuse Pullout Main-Range-Lighting Combinations
- Door Pullout Service Entrance Switches
- Toggle Type Service Entrance Switches
- Fuse Cabinets and Branch Circuit Attachments
- Outdoor Safety Switches
- Outdoor Service Entrance Switches
- Fused Lighting Panelboards
- Dead Front Distribution Panels
- Magnette Circuit Breaker Panelboards
- Quicklag "De-ion" Panelboards
- Nofuze Lighting Panelboards

The manufacturing facilities of the American Electric Switch Corporation have been acquired by the Clark Controller Company, and American is now a division of Clark.

The integration of these two organizations, each with more than 25 years experience in the manufacture of high quality electrical products, combines a wealth of engineering know-how, production and service facilities. American equipment now becomes an important part of the Clark line.

Increased Availability

Large factory stocks, complete stocks in strategically located warehouses, plus stock on shelves of distributors throughout the country, now assure availability of this equipment for fast, efficient delivery.

*Write for complete
descriptions and list
prices*

The CLARK  **CONTROLLER Company**
ENGINEERED
ELECTRICAL CONTROL
1146 E. 152ND ST., CLEVELAND 10, OHIO

wood brakes which contact the spool flanges.

Wire sizes are plainly marked by numbered metal tabs which clamp onto the angle-iron cross arm immediately above the reels. These can be quickly and easily changed when reels of different wire size are added to the table.

Biggest advantage reported by Phoenix mechanics is the time saved over the former method of searching out proper wire size, rolling the reel from storage rack and setting it up for winding coils. With the present setup, this can be done in a matter of seconds. This is in addition to the time economies provided by having a variety of wire sizes always ready for immediate pay-out.

Hinged Bars Form Slot Liners

Insulation paper for lining stator slots is formed to slot dimensions by a set of hinged steel bars in the motor repair department of Jones Electric Company, Muskegon, Mich. Mechanics like the ease with which they can make a firm crease in the paper with a mere flick of the wrist.

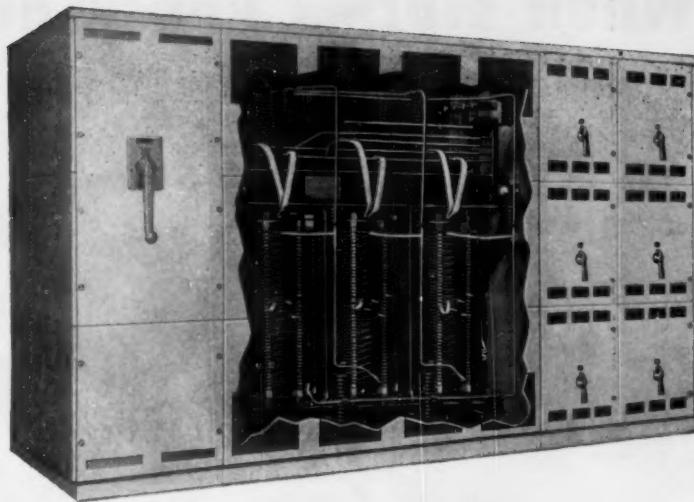
The handy portable creaser fits into any bench vise and is constructed of three pieces of flat steel. Two pieces of $\frac{1}{8}$ -inch steel, 12 inches long and 3 inches high, form the "seat" for the insulation sections. One 12-inch edge of one plate is beveled 45 degrees to form the bending surface. The two flat faces are bolted back-to-back with two bolts and wing-nuts. A sheet steel separator (0.025-in. thick) between the two plates can be adjusted up or down according to slot depth. The



HINGED BARS of flat steel form handy portable creaser for slot liners. Insulation is "seated" by spacer between two flat bars. Hinged section at top adds crease when pulled down to contact beveled edge.

Wagner®
TRANSFORMERS
...the choice of leaders
in industry

for a reliable
load-center
power supply
always specify...



Wagner PREDESIGNED

DRY TYPE TRANSFORMERS

**you gain
because:**

- } **you save shipment time**
you save job engineering costs
**you get full Wagner Quality with
switchgear of your choice**

Wagner "Predesigned" Dry Type Substation Transformers are carefully engineered for dependable load-center service. Predesigning completely eliminates individual job engineering . . . reduces your costs . . . and saves shipment time.

Wagner "Predesigned" Dry Type Transformers consist of standardized core and coils rated from 112.5 to 2000 kva. They are designed for indoor installation in dry, clean, well-ventilated locations. All unit substation builders have the information and coordination necessary to use

these transformers with switchgear of your choice. You can specify the Wagner Transformer that exactly meets your load-center distribution requirements—be assured of all the quality necessary to meet heavy industrial demands—and gain a substantial advantage in delivery time and in cost. Investigate the many advantages of specifying Wagner "Predesigned" Dry Type Unit Substation Transformers for your next load-center installation. Consult the nearest of our 32 branch offices, or write direct to us.



T54-10

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . OCTOBER, 1954

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES

AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

When storms knock out electric power...



an ONAN
Emergency Electric Plant
supplies essential electricity!
Prevents property damage: protects lives

Danger to life and property, loss of business and customer goodwill, all can be prevented with Onan Standby Electric Power. When electricity is interrupted for any reason, an Onan Standby Plant will take over the power load supplying 60-cycle "highline" current for lights, motor-driven machines, electronic devices and other equipment.

Onan Electric Plants are built to run continuously . . . for as long as the emergency exists. Require little space for installation, run smoothly and quietly. All Onan units can be equipped with automatic controls.

Onan gasoline-powered emergency electric plants are available in sizes from 1,000 to 50,000 watts A.C. . . fill any need for standby power.

Write for FREE estimate!

If you will let us know your requirements we will recommend the size and type plant you need.

D. W. ONAN & SONS INC.

8306 University Avenue S.E.
Minneapolis 14, Minnesota



1,000 to
50,000 watts

paper slides between the plates and rests on the separator.

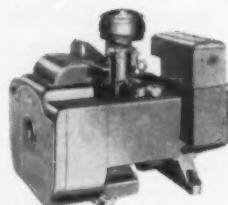
A third steel bar ($\frac{1}{8}$ in. by $1\frac{1}{2}$ in. by 12 in.) is hinged to the top of the back plate. When pulled down to contact the bevels on the front plate, this bar makes one crease in the stiff insulation paper. The slot liner is then reversed in position and a second crease added with another flick of the mechanic's wrist. Insulation paper varying from 0.005 in. to 0.020 in. in thickness can be creased.

Attention to Details Gives Shop Plus Values

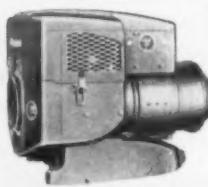
Attention to "minor" details in the Ray Bigger Electrical Equipment shop at Klamath Falls, Ore., results in numerous "minor" improvements in efficiency, accuracy and customer relations which, when added together, sum up to gratifying plus values.

For example, the Bigger shop files contain indexed cards with data on all motors serviced. These cards list such standard items of information as manufacturer, horsepower, speed, volts, phase and so on, but they also include information pertaining to bore, back iron, tooth details, iron width, slots, pitch and the like. On the rear of each card there is also a frame and coil sketch so that, if motor or loop construction is unusual, it is possible to quickly make notations regarding such pertinent "details" as the extension of coils from endbell fittings and point-to-point as well as complete circumference dimensions of loops.

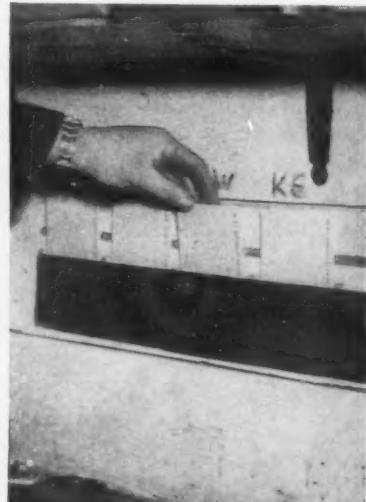
Another "detail" is the construction



MODEL 5CW 5,000 watts A.C.



MODEL 305CK 3,500 watts A.C.



HALF-ROUND MOLDING tacked to the wall behind card pockets pushes the tops of the cards forward, away from the wall, making it easier for shop personnel to grasp and lift the cards from these slots.



Installation by: Hultgren Electric Corp., Electrical Contractors, Chicago, Illinois.

50% Savings!

**Lighting installed at half the cost
with UNISTRUT® channel and fittings**

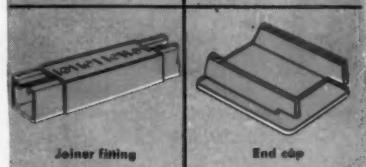
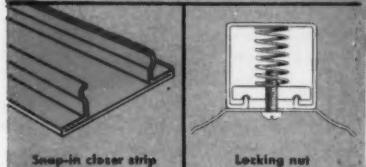
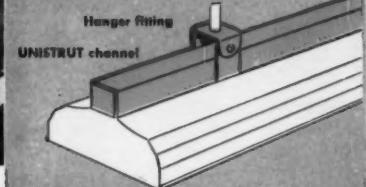
New fluorescent fixtures were recently installed on two floors of the Butler Brothers Building, Chicago, Illinois. The savings on this UNISTRUT installation over conventional methods was estimated at fifty percent. How did UNISTRUT reduce installation costs?

By using UNISTRUT channel with its continuous slot to attach fixtures quickly in perfect alignment. And by using the

same channel as a wireway. This fast, easy method cut costly installation time in half!

UNISTRUT channel insures true alignment. It provides the utmost in safety because the entire row of fixtures forms a single integrated unit. Fewer hanger rods are needed and a neater, more attractive installation results. Stems or rods may be placed at any point

Here are the simple, component parts of the UNISTRUT light supporting system



Joiner fitting

End cap

along the channel, permitting installation on irregular ceilings. Fixtures can be fastened in a continuous row or intermittently as shown here.

Get in touch with your UNISTRUT Distributor for the full, cost-cutting facts on light supporting with UNISTRUT framing.



U. S. Patent
Numbers
2327587
2329815
2345650
2363582
2363797
2405631
2541908
Other Patents
Pending

The World's Most Flexible All-Purpose Metal Framing

Distributors and warehouse stocks in principal cities. In Canada, Northern Electric Company. Consult your telephone directories.

Approved by—
**UNDERWRITERS'
LABORATORIES, Inc.**
as a Surface Metal Raceway!

UNISTRUT channel and fittings have been approved by Underwriters' Laboratories, Inc., for wiring lighting installations as well as for auxiliary power wiring.

Write today for free fluorescent lighting bulletin.

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd.
Chicago 7, Illinois

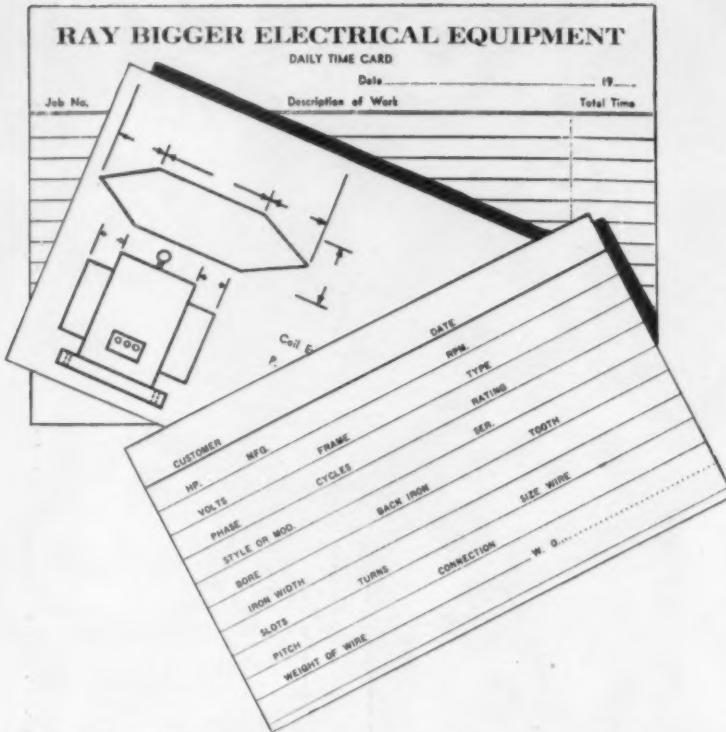
Dept. E-10

Name.....

Company.....

Address.....

City..... Zone..... State.....



REFERENCE CARDS list all normal information related to a motor, but they also include such pertinent data as the extension of coils from endbell fittings, bore, back iron, iron width, tooth details and the like.

of a series of temporary fiberboard filing pockets, located on the wall behind each work bench. Each pocket is large enough to hold a data card, time card and detailed sketch relating to a particular job and, to make it more convenient for an employee to pull these cards from their slots, a strip of half-round molding is tacked horizontally just above the various pocket openings. This wooden molding pushes the upper edges of cards forward, away from the wall, making it easier to grasp and lift them without having to pick at them with a finger nail.

Fan Rental a New Shop Service

Fan rental is the newest service offered customers by the motor repair department of Whittaker Electric Company in Muskegon, Mich. Whittaker now stocks a number of 20-inch electric fans which can be rented by the day, week or month at the following rates:

	Counter	Floor
	Model	Model
Day	\$ 1.00	\$ 1.25
Week	4.00	5.00
Month	10.00	12.50

Customer advantages of this system, as outlined in shop superinten-

dent Mel DeYoung's sales letter, are as follows:

1. No substantial investment in fan equipment which must be capitalized (and is taxable) even though the units are used only a few months out of the year.
2. No fan storage problem during the cool seasons.
3. No fan maintenance problem and cost.
4. Rental cost of the equipment is deductible as operating expense and hence is not taxable.

The Whittaker proposition is taking hold and several Muskegon industries are beating the summer heat with rental fans. After the prescribed rental period expires, Whittaker picks up the fans, restores them to top operating condition, and puts them in storage ready for the next season.

Handy Tape Drums Speed Coil Winding

Solid wood tape drums on each winding machine cut coil-tying time considerably and reduce tape waste in the motor repair department at Whittaker Electric Company, Muskegon, Mich. There is no fumbling with a roll of tape, trying to rip it with fingers, or trying to cut it with a scissors to desired length.

Pre-cut strips on the tape drum are ready to wrap around the ends of multi-turn coils after the winding operation has been completed to keep the conductors in place.

Each wood drum is 10 inches long, approximately 6 inches in diameter and equipped with a crank. The assembly is bracket mounted, at comfortable working height, in front of the drive pulleys and to the left of the winding head. An extension of the base bracket forms a hand rest and wire guide immediately in front of the coil form, facilitating the winding operation and reducing fatigue of the machine operator.

A series of slots, each about $\frac{1}{2}$ inch deep, are cut on the drum surface parallel to the axle and to each other. The segments thus formed indicate a measure of tape length. Suppose a strip of tape is wound completely around the drum. Three segments (4 slots) would be a 2 $\frac{1}{4}$ -in. length of tape; seven segments (8 slots) would give a 5-in. length of binding tape. Since relative length is more important than exact measurements in inches, no attempt has been made to establish an imprinted scale on the drum itself.

When "loaded," the drum contains about 20 rows of $\frac{1}{4}$ -in. wide tape (fewer rows of wider tape) wound around the cylindrical surface. When the mechanic starts winding coils, he cuts the binding tape to desired length by sliding a knife blade along two of the drum slots. Two slashes of the blade cuts 20 pieces of tape which he can quickly flick off the drum and apply to the coils. With a little practice and experience, the average coil winder can tell at a glance which slots (and how many drum segments) he should use to cut tape to desired length.



SEGMENTED WOOD DRUM on coil winding machine provides economical method of securing pre-cut lengths of binding tape in quantity. Tape is wound on drum in parallel rows, then cut to desired lengths to tie turns of multi-conductor coils.



Here's how I can help you convince management

Put yourself in management's shoes for a minute. For certain, you'd be taking a look—a *long* one—at practical ways to make your products better, faster, cheaper. Competition has forced just such a look.

And that's where I—and Westinghouse Distributors like me—can help you convince plant management.

We'll show you how our products and headquarters engineering services mean better plant efficiency, fewer outages, less maintenance—tangible benefits that make sense to the men upstairs.

PROOF?

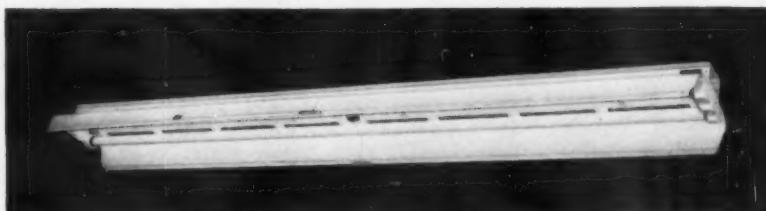
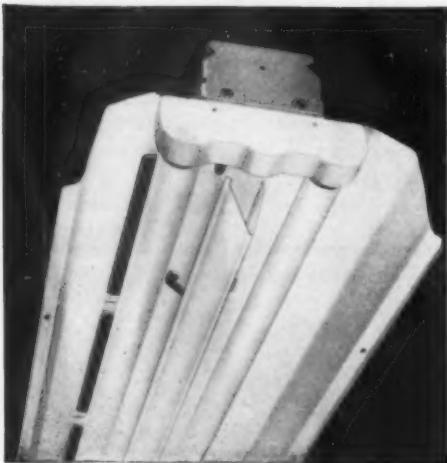
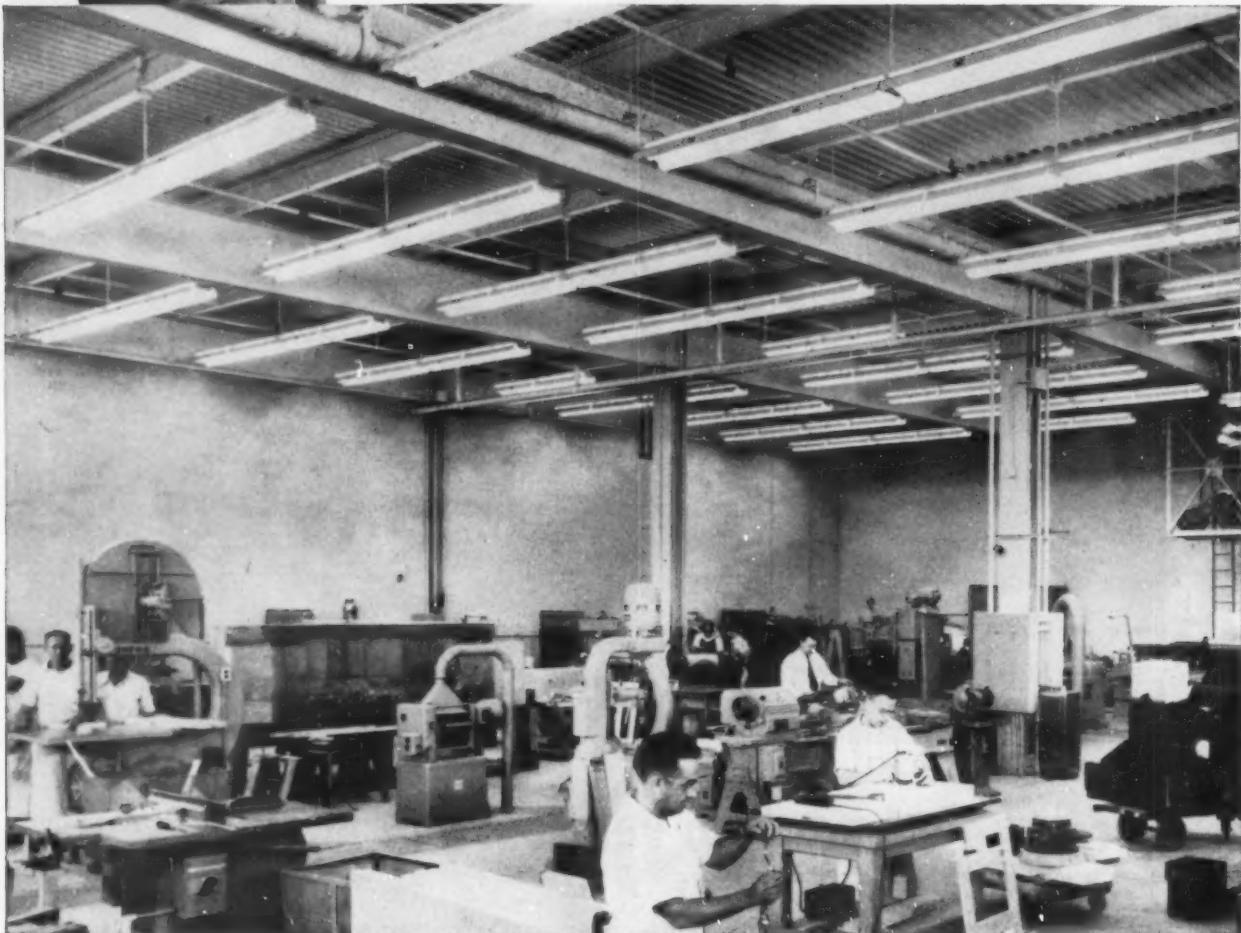
Check the next seven pages for specific examples of how Westinghouse products and services help you sell yourself to management.::: DP-5004-A

YOU CAN BE **SURE**...IF IT'S
Westinghouse





A common sense recommendation for improved production: upward component lighting. The better the light, the better people can work.



Westinghouse upward component fixture means this to plant management: Better efficiency in those areas where effortless, accurate vision is essential. Fixtures stay clean longer . . . operate cooler due to air circulating through apertures in reflector. Less maintenance is required. Available in slotted and non-slotted styles.

These construction features simplify job for installers and maintainers. One-piece channel is lightweight, easy to handle. Large, easy-to-grip wing locks hold reflector in place . . . no loose parts, no tools needed for installation or removal of reflector. Steel-enclosed lamp holder eliminates breakage. Starter socket is positively identified.

DP-3004-B

New Westinghouse SDP Luminaires step up work quality and safety

Semidirect lighting was recommended for this plant's new wing where high production depends materially on critical seeing.

2200 Westinghouse SDP's were installed, making possible more comfortable lighting at higher illumination levels. Their 22% upward component of lighting makes the light-colored ceiling a part of the lighting system.

Result: Shadows and uncomfortable brightness disappear. Better working conditions and safety are assured.

Whether it's for modernization or new construction, Westinghouse has a wide variety of luminaires to answer industrial lighting problems.

Your Westinghouse Distributor has the facts.

Use dry-type transformers to supply plant lighting from high-voltage distribution

Westinghouse Dry-Type Transformers enable you to serve your lighting loads from a high voltage power distribution system . . . economically.

That means you can serve both power and lighting loads with economical high-voltage distribution—reducing it to utilization levels close to the center of the load.

The benefits are immediate. There's less copper to buy. Excessive line losses resulting from long low voltage runs are eliminated, and better voltage regulation is assured.

The small, lightweight dry-type transformers are easy to mount—can be installed on walls, posts or overhead platforms. No vaults or protective barriers.

DP-5004-C

Type E, totally-enclosed dry-type transformer is ideal where dirt, lint and nonexplosive dust are a problem. Small and lightweight; can be installed anywhere. Maintenance practically eliminated. Periodic blowout unnecessary.



YOU CAN BE SURE...IF IT'S **Westinghouse**

Westinghouse Distribution Panelboards feature screw driver convertibility



*Here's a product flexibility story
that spells out this benefit
to management: quick
production change-overs.*

Westinghouse Convertible Distribution Panelboards have designed-in flexibility to easily accommodate the change-overs modern industry is continually making in its production lines.

Circuit rearrangement—to meet load shifts or expanding power requirements—can be made quickly and economically.

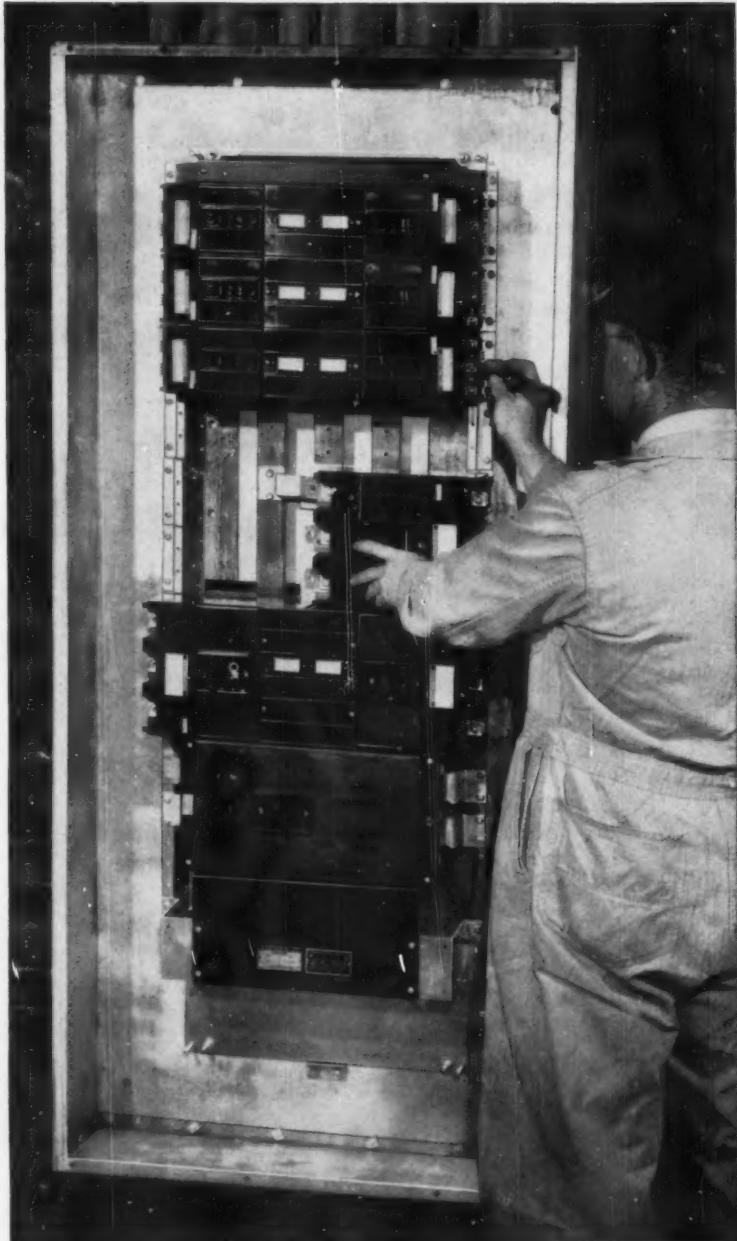
Type CDP panelboard, above, is an example of how Westinghouse designs flexibility into an electrical system to meet load shifts. Its convertibility feature means that one or more breakers can be replaced with larger or smaller ones to match circuit protection specifically to a plant's changing production facilities.

And this conversion can be made with a screw driver—due to the pretapped busbars, back pan and other standardized parts.

DP-5004-D

Type CDP—designed for flexibility in rearranging circuits to changing load conditions. You can change over branch circuits quickly and easily with this panelboard. Buses and back pan are drilled and tapped to accommodate any breaker from 15 to 600 amperes.

More Westinghouse product benefits that help you sell better, lower cost production through modern electrical practices . . .



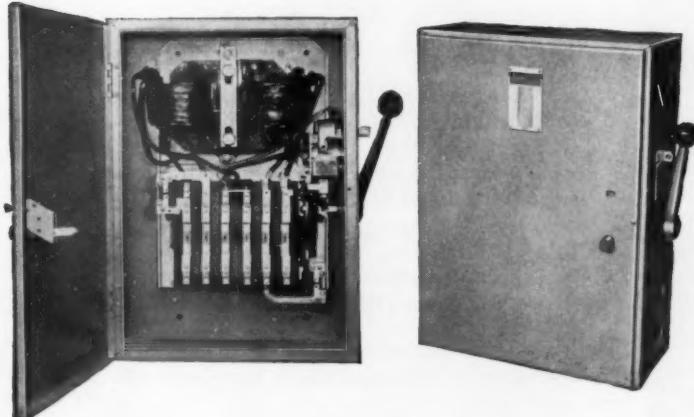
YOU CAN BE SURE...IF IT'S



"Package plan" speeds your AB-I installations. Enclosures and breakers are packaged separately. It's no longer necessary to remove breaker before mounting enclosure. Mount enclosure first. Make conduit and cable runs. Then, insert AB breaker and connect it in the enclosure. This cuts one installation step. Enclosures and breakers available from stock.



Sell less down time with AB-I's by checking off these circuit breaker advantages: 1. No tripping on temporary, harmless overloads. 2. Service restored speedily after heavy overload interruption. A flip of the handle does it. 3. No danger of over- or under-fusing. No fuses to stock or replace. Shown above: new NEMA XII (JIC Standards) enclosure.



New Type MB manual auto starter. Designed for application wherever across-the-line starting current of squirrel-cage induction motors is likely to exceed local power restrictions or interfere with plant operations. Keeps current inrush within limits and still gives maximum starting torque. Protects against overload or low voltage.

Consider these advantages of the new Type MB auto starter. All sizes employ double-break, silver-alloy contacts—minimizing pitting, burning, sticking. Oiling of moving parts not required. Foolproof, too, operating handle cannot be moved from start-to-run position until specific acceleration period has elapsed. Trouble-free sequence mechanism, operated by synchronous motor, does the timing.

DP-5004-II

Westinghouse





New heavy-duty enclosed switch spells added protection for operators

Complete protection for operating personnel. This is an outstanding feature of the new Westinghouse Type "H" Safety Switch—now ready for rugged, heavy-duty industrial applications.

Available in a complete range (up to 1200 amps and 600 volts), it provides an interlocked cover that cannot be opened when the switch is in the "ON" position. And a Micarta® shield is located over the line terminals. Thus, exposure to the live parts is minimized during inspections or fuse replacement.

Further, this new safety switch offers these "plus" advantages:

1. Neoprene gasket and trunk-type cover latches—resulting in Nema-1A dust-resisting enclosure.

2. Operating mechanism is contained in a rugged cast handle—leaving side gutters free for wiring.
3. Copper parts are tin plated—minimizing corrosion and high resistance oxidation.
4. Westinghouse Exclusive Diamond-pointed Break Jaw and Extended Blade. Arcing occurs outside contact area—keeping parts clean.
5. Westinghouse Exclusive De-ion® Arc Quenchers—extending contact life.

The new Type "H" safety switch is part of a complete Westinghouse line—available for every industrial application.

DP-5004-F

YOU CAN BE **SURE**...IF IT'S
Westinghouse



Aluminum bus bars now available in Westinghouse Bus Duct

Westinghouse Bus Duct with aluminum bus bars is new. And highly significant is the plating process—the positive adhesion of silver to aluminum to assure low electrical resistance at bus bar connections.

This exacting process involves electroplating over zincate. It utilizes a silver-on-silver plating method. Better adhesion is obtained. Corrosive action is minimized.

If damage causes a break-through in the silver plating, the silver undercoat will not form a resistant oxide.

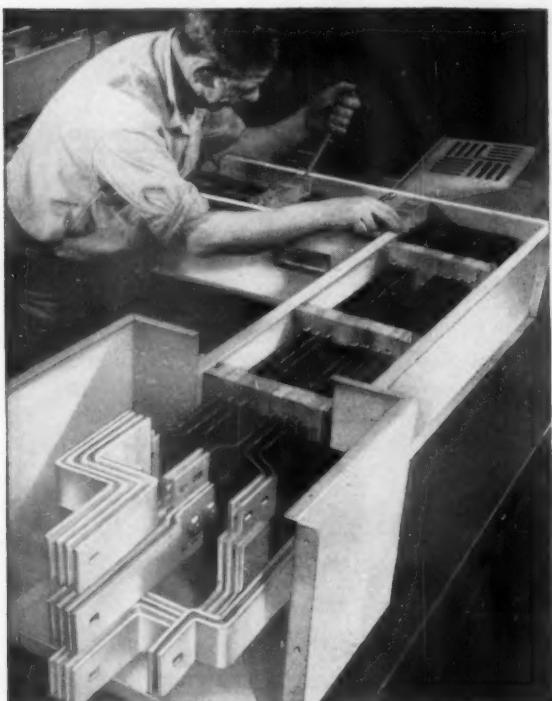
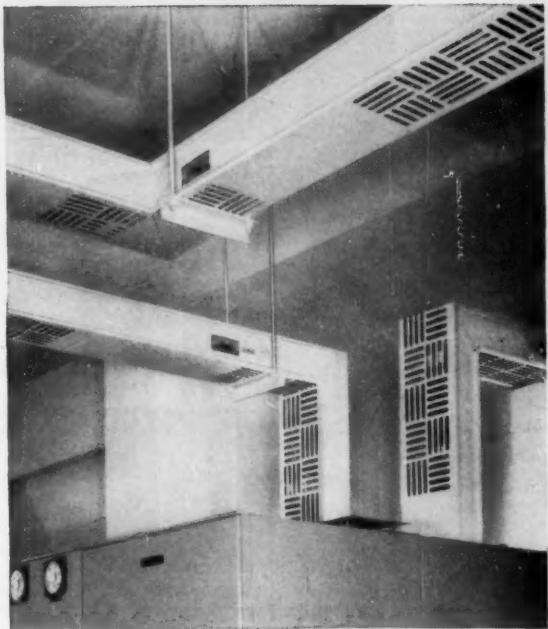
Additionally, new aluminum bus duct offers these features inherent to the complete Westinghouse Bus Duct line:

More power per dollar. Presently available through 3000 amperes, it has greater current-carrying capacity, pound for pound, than cable and conduit.

Lower installation cost. Prefabricated in sections, bus duct goes in faster than cable and conduit.

Unequaled flexibility. Installs easily in any layout around any obstruction. Can be relocated at any time.

DP-5004-G



Final assembly follows plating process that guarantees silver adhesion, thickness and uniformity on aluminum bus bars.



Silver-on-silver plating process uses selective tanks and timing controls with modern automatic and mechanized equipment.



A complete line of products from a single source

It means this: Your nearby Westinghouse Distributor is a one-call, one-stop source for your electrical apparatus requirements.

He offers complete product lines—Westinghouse Apparatus that's engineered for simplicity and features standardized design to speed your installation work.

He has full product stocks readily available from centralized warehousing facilities. This pinpoints responsibility. It assures quick delivery and helps

you make your installations in minimum time.

And through your Westinghouse Distributor you get all the engineering, product and application assistance you want. Teams of Westinghouse specialists bring these to you . . . help analyze the electrical problem . . . select, coordinate and apply equipment.

Get in touch with your Westinghouse Distributor for complete information. He is as near as your telephone.

DP-5004-H

YOU CAN BE **SURE**...IF IT'S
Westinghouse



Practical Methods

Full-Load Stand-By Protects Hialeah Track

Automatic switches immediately transfer vital pari-mutuel circuits to synchronized diesel-generator bus in case of commercial power failure.

EQUIPMENT

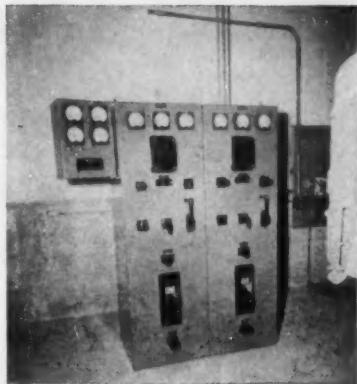
The odds are mighty long against any prolonged electric power interruption at the famed Hialeah Race Course in Miami, Fla. Track owners saw to that when they added emergency stand-by electrical facilities of sufficient capacity to handle the entire track load in the event of power failure. This installation was part of an improvement program which included replacement of the 22-year old clubhouse at the track.

Economic protection as well as safety and convenience prompted this decision. In case of a power failure, the pari-mutuel boards, mutuel machines, calculators, automatic totalisators and public address system become completely inoperative in a matter of seconds. Should this occur while horses are on parade to the post, or during the racing day, the track would be obliged to return all money which had been wagered on the race. Daily

betting at Hialeah averages about \$1,000,000 of which the track gets 7%. Without adequate stand-by service, a power failure could mean a substantial income loss to track management.

Protection against such an occurrence is provided by two Caterpillar D375 diesel electric sets, each rated at 210-kw output. They are housed in a separate 24-ft. by 30-ft. stuccoed, concrete block building some 75 feet away from the clubhouse. One unit has right-hand controls; the other, left-hand controls. A removable steel operating platform (16 inches high) between the two units permits the operator to regulate both machines from one position. The engines are cooled with heat exchangers and electric motor-driven self-priming raw water pumps at two wells. Waste water is discharged to sewer lines.

Maximum noise elimination is secured by using residential type muf-



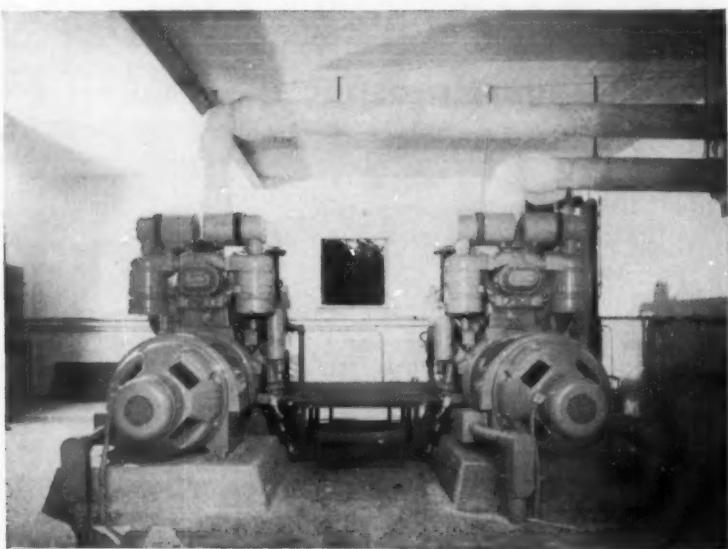
TWIN-UNIT CONTROL panel contains necessary circuit breakers, meters, regulators and switches to synchronize the two generators on panel bus and pick up emergency loads when required.

flers on the engine. Walls and ceilings of the engine room are covered with acoustic tile to reduce inside noise level for operator comfort. Foundations under the engine-generator units are completely isolated from the building floor. As an added precaution, a plywood and rock wool noise baffle is constructed three feet inside and outside of the main door to the stand-by power building. Wherever possible, piping and conduits are concealed in floor trenches covered with steel deck plate.

Switchboard equipment consists of a 2-unit enclosed panel with circuit breakers, field switches and discharge resistors, rocking-type regulators, synchroscope and synchronizing lights, bus ammeter and voltmeter, wattmeters, voltmeter and ammeter selector switches, exciter field rheostats and frequency meters.

The diesel generators are started by air stored in two 25 cu. ft. air receivers, one of which is kept valved off at all times as a reserve air supply. Both receivers are charged by an air compressor operated by an electric motor and gasoline engine drive.

At the beginning of each racing day, both generators are started and a small stabilizing load of about 60 kw is put on the first generator. The second unit is then synchronized with the first on the switchboard bus and takes about one-third of the stabilizing load which is maintained to keep both units syn-



TWO STAND-BY diesel electric generator sets, each rated 210-kw output, run synchronized on emergency bus during racing day at Hialeah track; immediately take over vital track electrical load through five automatic circuit transfer switches in case of normal power service failure. Units can handle entire track connected load.



TO BUILD **Stab-lok® SALES SELL BUILDERS** (they're your biggest prospects)

FOR QUANTITY SALES of Stab-lok Circuit Breakers there's no one else equal to the builders in your area. They know that modern circuit protection goes over big with prospective home buyers, and that Stab-loks cost only pennies more than old-fashioned fuse boxes. Besides that, Stab-lok is the most flexible circuit breaker line ever marketed...it's Magic "E", sequenced bussing, standard NA and space saver NC breakers permit an amazing choice of circuits when first installed and when later changes are required.

And only Stab-lok provides these extra advantages:
Complete dependability — More Stab-loks are being installed today than all other circuit breakers combined...they're the only breakers service-proved in millions of homes.

Lowest cost — Across-the-board, Stab-lok costs less than other circuit breaker; less in the first place; less to install; less when circuits are changed or added.

Most complete line — With its unequalled range of enclosures, Stab-lok meets every sensible specification for circuit protection easily and quickly.

Most distributors — No matter where you are located, you can get fast delivery of Stab-lok breakers and enclosures at any time.

Don't pass up your smaller Stab-lok prospects, but for top sales go after the *builders*. And write for the Magic "E" booklet that brings the whole Stab-lok story up to the minute. Federal Pacific Electric Company, 50 Paris St., Newark 1, New Jersey.



FEDERAL PACIFIC ELECTRIC CO.

FORMERLY — FEDERAL ELECTRIC PRODUCTS COMPANY AND PACIFIC ELECTRIC MANUFACTURING CORP.

Main Office: 50 PARIS STREET, NEWARK 1, N. J.



Federal Pacific products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct, High voltage circuit breakers and power switches ★ Sales offices in principal cities.

chronized. If a power failure occurs on the regular service lines, five strategically located automatic transfer switches immediately transfer a large portion of the race track electrical load to the generator units.

Automatic load transfer, with the generators running at all times during the racing day, is used because it is faster than automatic starting of the diesel-generators. This prevents even a short power interruption which would occur if the generators had to be started before taking over the load. Prime circuits handled by the automatic transfer switches include those serving the pari-mutuel boards, mutual machines, calculators, automatic totalisators and public address system. Total load on automatic throw-over approximates 125 kw. Total track load, including kitchens, is about 375 kw.

Other circuits, because of the nature of their operation, are transferred manually to the stand-by generators. These include, elevators, escalators, electric timers, lights, water pumps and the kitchen loads.

Shop-Made Dolly Serves As Mobile Reel Rack

CONSTRUCTION

By ordering wire on disposable reels in lengths of 2500 feet, then mounting the reels on rubber-tired dollies made in their own shop, electrical contractors Wismer & Becker of Sacramento, California, obtain several important benefits.

For example; the bothersome detail of carting empty reels back to their warehouse for subsequent return to manufacturers is eliminated, wasted wire caused by the accumulation of

numerous short end lengths is lessened, the reels may be easily wheeled into any desired position for convenient use, and wire unreels in a straight line, without any danger of loops or kinks, ready for direct pulling into raceways.

As indicated in the accompanying photograph, the dollies are of simple construction, consisting essentially of formed bar stock, lengths of angle irons and bent conduit welded together to form the basic framework. Hooks to hold the reel spindles in position are also welded to the upper surface of the frame, as shown.

The dollies are compactly dimensioned so as to permit ready passage through normal-width doorways, and the rubber tires prevent wheels from marring woodwork, terrazzo or other finished floor surfaces.

The weight of a dolly plus the weight of the reels it supports is generally sufficient to prevent the dolly from sliding or otherwise shifting position. However, if it is imperative that slipping be prevented for any reason, the tires may be blocked.

Use Camera to Show Installation Problems

MANAGEMENT

Visual proof in the form of a photograph is a most convincing argument when it comes to resolving an installation problem on an electrical construction project. That is the philosophy of P. E. Morrison, vice president in charge of construction for Whittaker Electric Company in Muskegon, Mich. That is why he keeps a Polaroid Land Camera (print available in 60 seconds) handy on all jobs under his supervision. Within a few

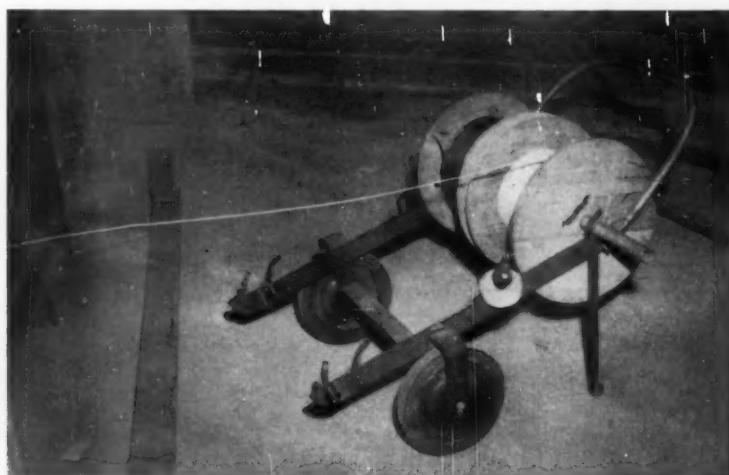


PAUL MORRISON, vice president, Whittaker Electric Co., keeps his trusty Polaroid camera on the job site to record and quickly dispatch photos of installation problems for quick approval of alternate plans.

minutes he can record the evidence he needs to study a problem, bolster a request for rerouting a feeder or possibly pinpoint the reasons for current installation status. Before the day is over, the photo with an explanatory letter can be on its way to personnel who are authorized to approve or reject the proposal.

In fact, Morrison has used this technique to advantage in several cases. On one project, plans called for racking of feeder cables on a specific exterior wall—a location where the installation would be subject to the hazards of heavy ice loads during the winter. Mr. Morrison photographed the location in question, pointed out the hazards plus an alternate routing and mailed the information to the chief engineer some 200 miles away. Within short order he received approval to proceed as he had outlined. In another instance, the Whittaker organization was being questioned about an apparent lag in installation schedule. A photograph of some equipment waiting around to be installed by others accompanied his letter of explanation. Visual proof of this reason removed the onus of delay from the electrical contractor and placed it where it belonged.

These selected examples illustrate the way Whittaker Electric uses the Polaroid camera on the job site. Development of a photographic record of installation techniques for instruction or sales application is purely incidental. The prime objective is to help solve installation problems quickly by cutting the normal time delay in securing approval of suggested changes.

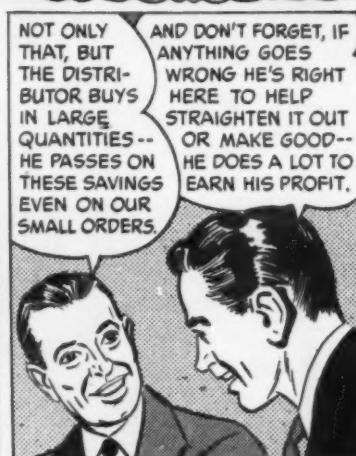
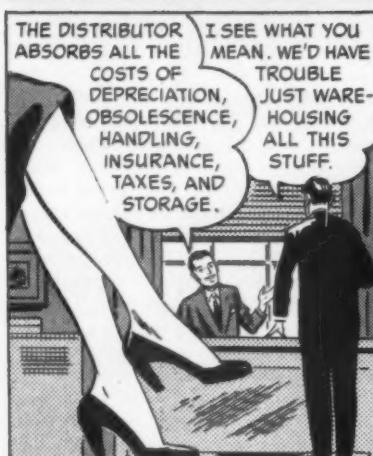
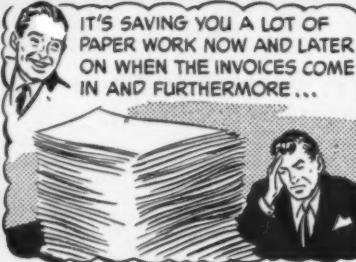


DISPOSABLE REELS, extra length wire, and rubber-tired reel racks greatly simplify on-the-job wiring, for then reels may be positioned exactly for most convenient use, and wire may be pulled directly into raceways without danger of kinking.

THE HIDDEN COSTS ARE OFTEN THE BIG ONES!

SAYS:

A. L. WOODS
Director of Purchases
Wolverine Tube



"Remember in emergencies or for everyday electrical needs, it pays to call your local T & B distributor—he saves and serves by simplifying your purchasing problems and reducing your costs."

In keeping with our policy of selling solely through Electrical Wholesalers, we are pleased to sponsor the above message on behalf of T & B distributors throughout the nation.

THE THOMAS & BETTS CO.

INCORPORATED

Elizabeth • New Jersey

The Thomas & Betts Co., Ltd., Montreal P.Q., Canada
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898



1426

Modern Truck Important Advertising Medium

PROMOTION

From Bill Powell, vice president of the Crown Electric Maintenance Company of San Francisco, come several canny observations concerning trucks and their value as a promotion medium.

He comments: "We believe that trucks are traveling salesmen, constantly making contacts and impressions—either good or bad—for the company they advertise. Therefore our trucks are fully equipped with up-to-date gear and well stocked with parts, for we have found that many people judge a company's potential workmanship by the completeness and degree of modernism revealed by that company's tools and apparatus. We also keep our trucks spick and span clean, for we have also discovered that many people subconsciously evaluate the quality of potential workmanship by the neatness, appearance and general condition of a worker and all of his equipment. And then we always strive to obey traffic rules and extend the 'courtesy of the road' to other motorists at all times, for we never know when the car behind us may be driven by our best customer—or by our best customer's wife."

Mr. Powell knows whereof he speaks, for several of his present customers have admitted to him that a Crown truck prompted their first phone call for service. The truck, in effect, was a Crown salesman's "foot in the door." After the initial contact, of course, the customer was presented with such other "normal" sales points as 24-hour service, technical know-how, reasonable rates and efficient employees. There can be no doubt that such points are much easier to make to a customer who has already been favorably impressed.



CATCHING THE EYE and impressing motorists and pedestrians with the neatness, completeness and modernness of Crown equipment is the obtained objective of this truck.

New
Another  Design

ABSOLUTELY

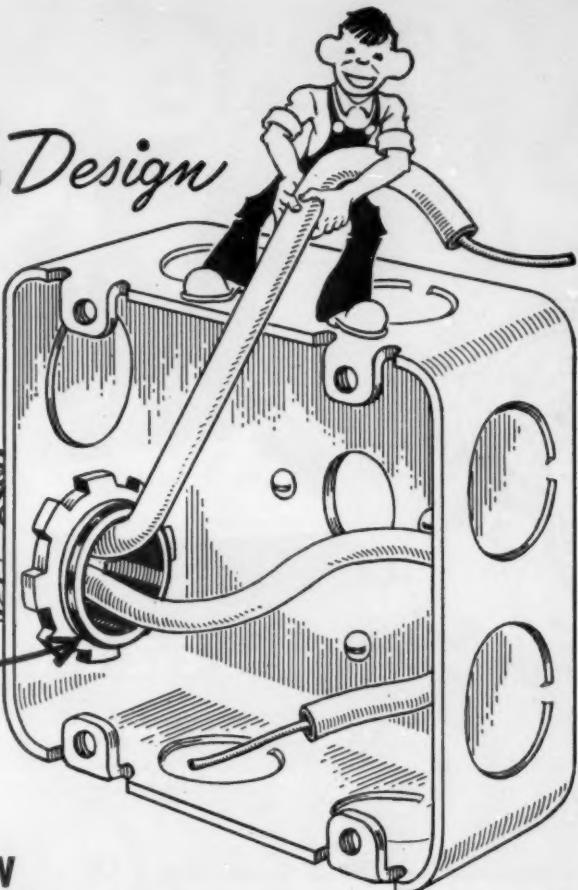
**THE FIRST
OF ITS
KIND**



T&B's new Insulated Throat E.M.T. Connector meets NEC requirements for protecting cable sheath or wire insulation against damage from burred or unevenly cut conduit. Sizes $\frac{1}{2}$ to 2 inches.

A bright blue, factory-inserted insulating liner completely covers the area inside the connector throat and provides a rounded, burr-free passage for wiring. The liner is extremely tough with a smooth, resilient surface... unaffected by common acids, solvents, moisture, and fumes. A lip protrudes slightly beyond the connector body forming a tell-tale bright blue ring—similar to other T&B "blue" fittings, visual assurance for an inspector that the connection is insulated.

There's no other fitting comparable to T&B's new Insulated Throat E.M.T. Connector! No separate in-



**T&B's new
Insulated Throat Connector* for E.M.T.**

(THINWALL)

sulating bushing needed. Installs just like a conventional connector. Same wrench size fits both body and gland hexes.

And it's up to 50% longer than conventional connectors! The extra-deep body provides a much greater area of firm, rigid support for the tubing. Conduit *has* to line up properly. Runs are straighter. Steel body, gland, ring and locknut are your assurance of uniform strength and dimensional accuracy. A free sample and descriptive literature will be sent to you with no obligation. Write to T&B today.

*Patent Applied For

LOOK FOR THIS SIGN —



IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

T-420

THE THOMAS & BETTS CO.

INCORPORATED

34 Butler Street • Elizabeth 1, New Jersey
Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898



New E-Z SEE dial!

Now INTER-MATIC time switches
are easier to read than your watch

Black on yellow is the most legible color combination known. That's why it's used on traffic signs and airport markings.

Inter-Matic has developed the new E-Z See dial, using new, larger numerals in instantly readable black on yellow colors. With the Inter-Matic "pull out, twist to set" feature, it is the fastest setting dial ever used in a time switch.

Contractors and sign men will save valuable installation time. The E-Z See dial is standard equipment on all models and combines with all the other outstanding features to make Inter-Matic the finest time switch available.

Write
for Bulletin TS68 for full information and prices

INTER-MATIC
TIME SWITCHES

INTERNATIONAL REGISTER COMPANY
2624 West Washington Boulevard • Chicago 12, Illinois

Long Wiring Plans Rolled on Spindles

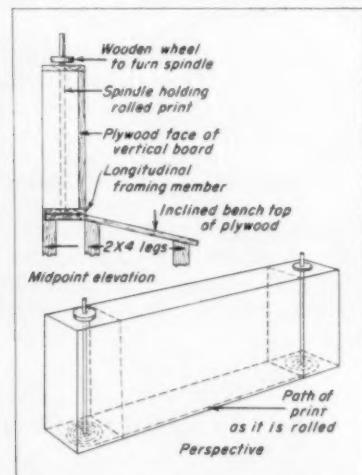
FIELD OFFICE AID

Motorists whizzing across vertical-lift highway bridges rarely are aware of the tremendous amount of electrical equipment and wiring related to the operation of these structures. In fact few contractors fully appreciate the electrical scope until they actually work on such a project. When they do, however, they are generally impressed—and sometimes a bit startled as well—to discover that some of the prints pertaining to the intricate wiring measure over 40 feet in length. This was the case when Lightning Electric Service Company of Newark, N. J., recently wired an \$8.5-million vertical-lift highway bridge over the Hackensack River for the State of New Jersey.

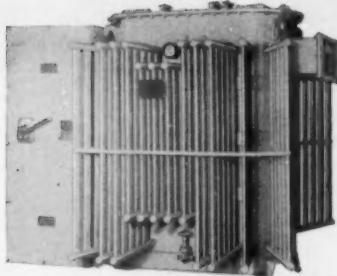
Since frequent reference to these prints was necessary throughout the installation period and since constant rolling and rerolling of the extra-length drawings to refer to specific details was bothersome, Lightning designed and constructed a vertical reference board which they located atop the rear lip of their field-office planning bench.

This board was constructed of plywood, and it was flanked on either side by a niche containing a vertical spindle upon which the wiring prints could be rolled. The spindles are turned by means of wooden wheels at their tops and, to afford easy access to these turning wheels, a section of the inclined bench top was made removable so that the men could move in close to the board if they wished. The

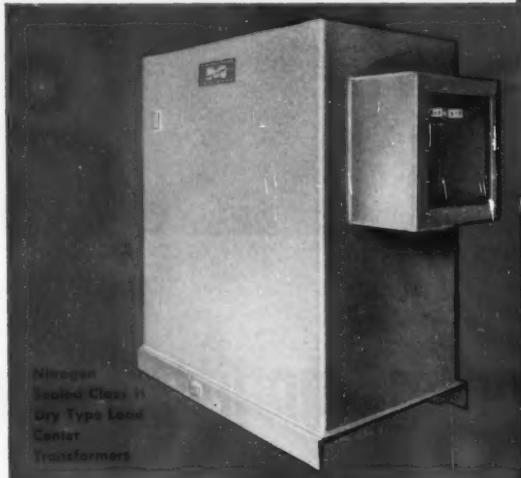
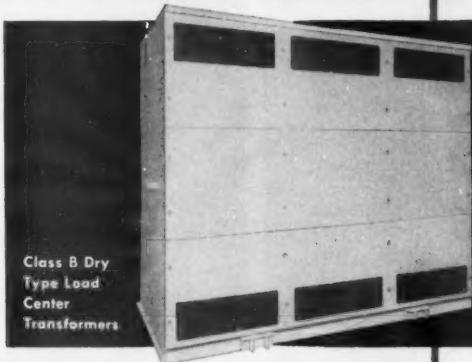
the most
DEPENDABLE
time switch
on the market



VERTICAL REFERENCE BOARD with spindle at either side in recessed niche permits long print to be rolled left or right with minimum effort, keeping bench top uncluttered, and keeping prints clean, uncreased and untorn.



Askarel Load Center Transformers



PROTECT YOUR PLANT AGAINST HEART FAILURE

Your load centers are the *very heart* of your entire production picture. They must provide a constant supply of power for machinery, materials handling, processing equipment, tools and illumination. Dependability is a load center requisite . . . for profitable, uninterrupted production. Any power failure means lost time, rejects, inefficiency and added costs.

Protect your plant against heart failure. Install dependable Moloney Load Center Transformers and be assured of an uninterrupted flow of power under all operating conditions.

ME54-92

Moloney Load Center Transformers are noted for dependability and provide these plus features:

1. Location Flexibility
2. Quiet Operation
3. Efficient Operation
4. Low Maintenance Cost

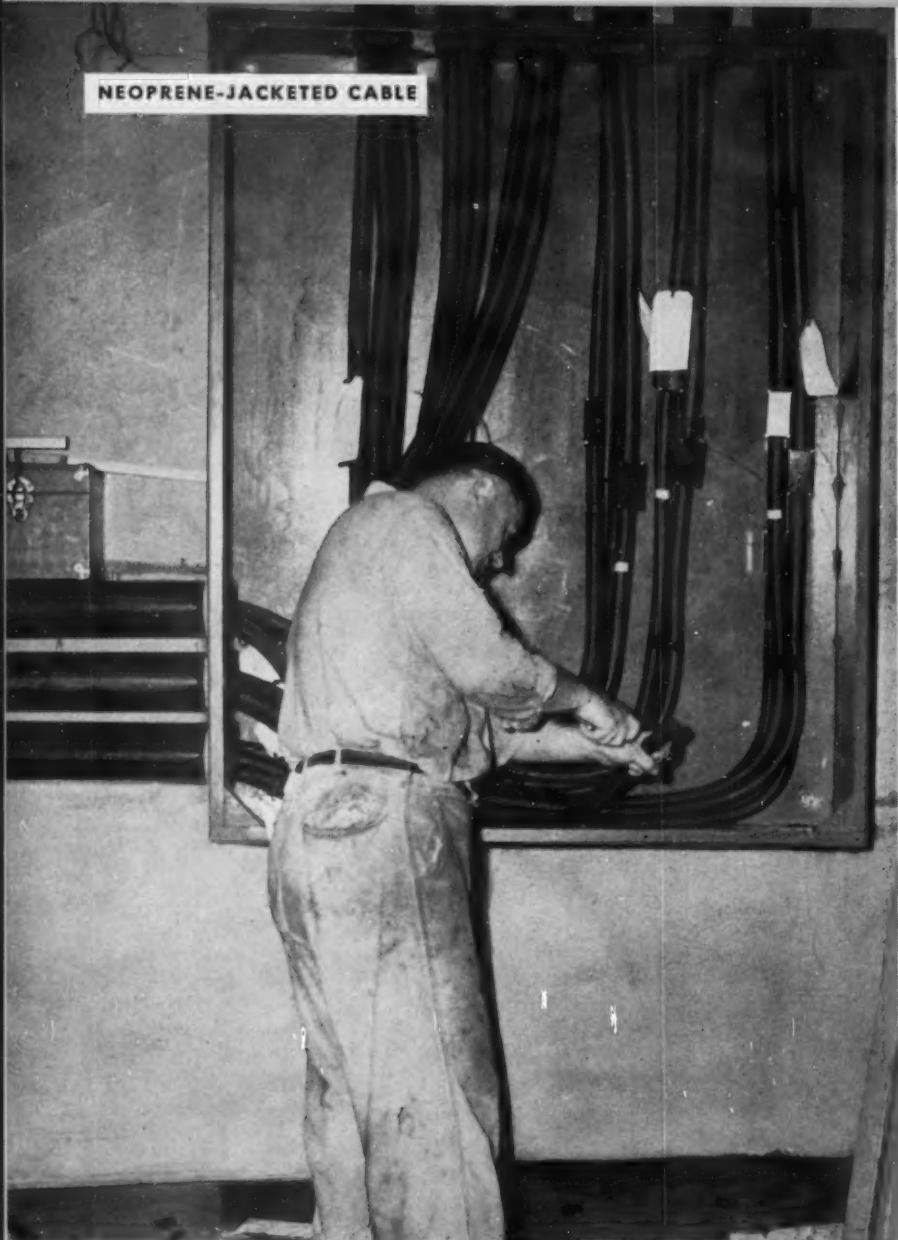
MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Tap Changing Transformers • Load Center Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

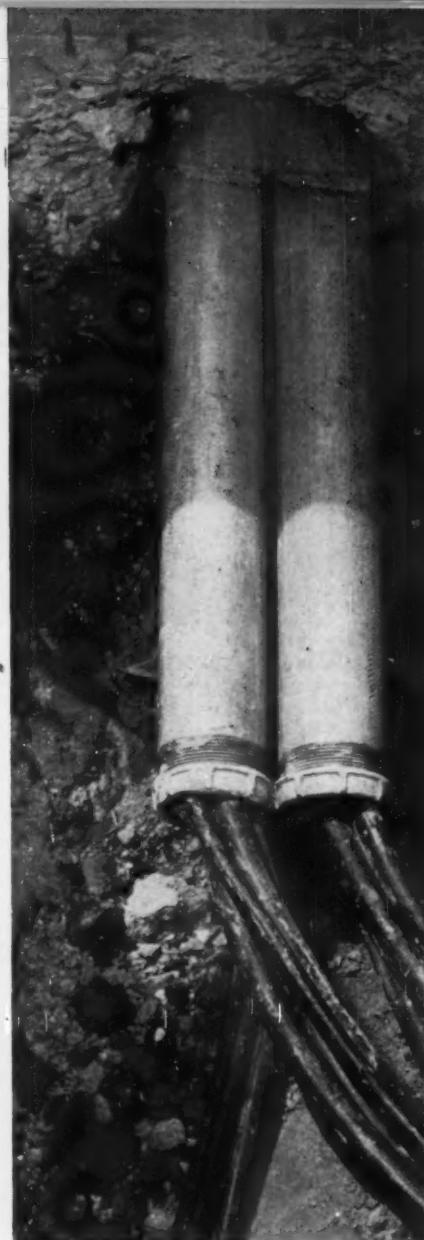
SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA



NEOPRENE-JACKETED CABLE



... FOR PLANTS



How to get premium wiring for little more

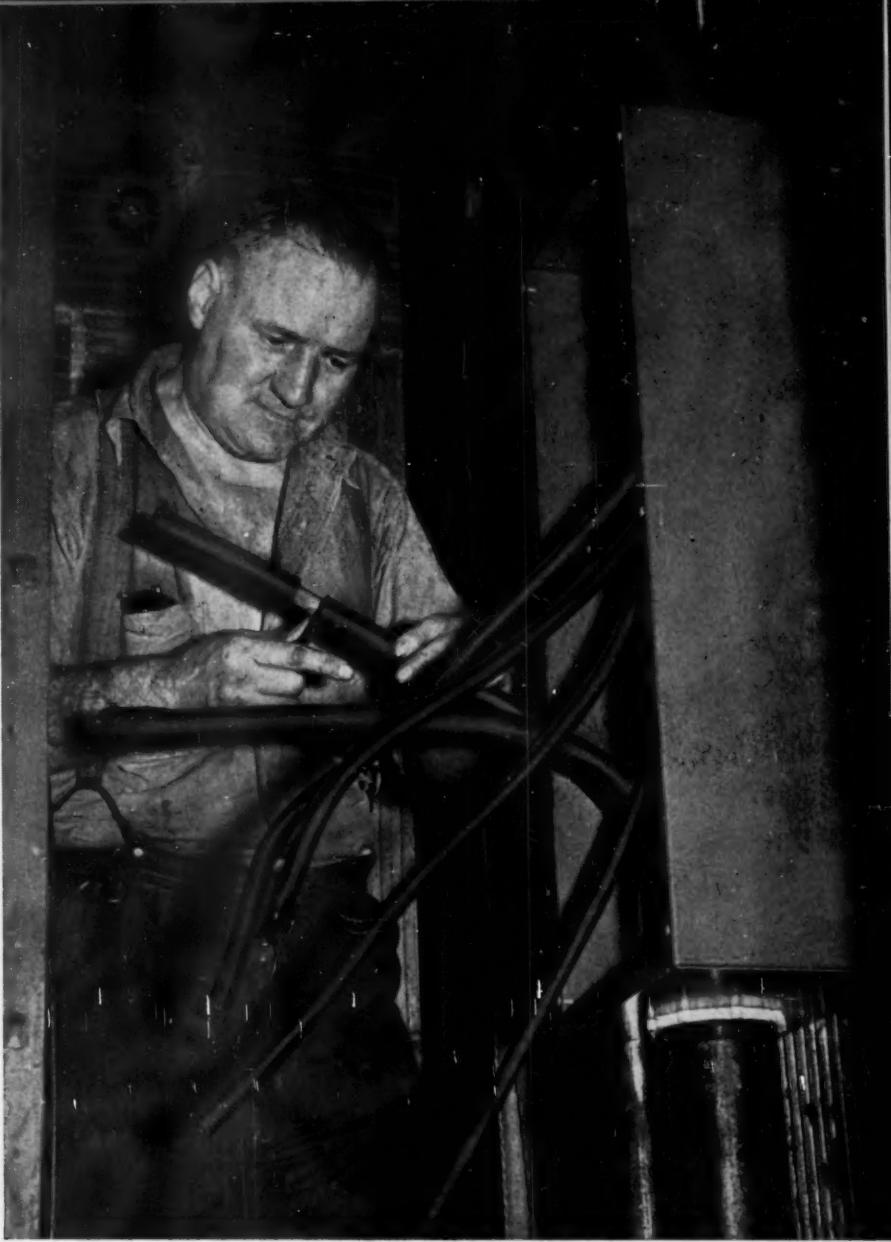
**The cable to use is DURASHEATH.
Its actual over-all cost is so little more
than the cheapest cable**

Wait! Before you buy cable on price alone, see how *little* a premium wiring job actually costs. And what good insurance it is!

When you're wiring up, for power or lighting, the price of wire and cable is but a *fraction* of the over-all cost. Simple arithmetic follows — *it makes very little difference in the total cost of the job* whether you buy



...FOR UTILITIES



...FOR COMMERCIAL BUILDINGS

than you now pay

the cheapest cable or a premium cable like neoprene-jacketed Durasheath*.

But what a difference there can be in performance!

Anaconda's Durasheath is tough . . . heat-resistant . . . long-lasting. Its rugged neoprene jacket resists moisture, chemicals, sunlight, corrosion, electrolysis, abrasion and mechanical injury. It delivers real service de-

pendability year after year.

And Durasheath is good for almost any job you have. You can bury it directly in the ground . . . run it in damp ducts . . . string it overhead . . . in one continuous run with minimum splicing. Order through your Anaconda Sales Office or distributor. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*Reg. U. S. Pat. Off.

ANACONDA®

Primary and secondary distribution cable • building wire • portable cords and cables • mine cable • magnet wire • copper, aluminum, copperweld conductors • signal, control and communication wire • wire and cable accessories.

64806

Baldor

New... BALTRIC® MOTORS

NEW NEMA Re-rated FRAMES

Now in Production

The new BALDOR Baltric motors—smaller NEMA frames • more horsepower • less weight • streamcooled • totally enclosed • high performance • cool operation • simple design • compact contour rugged construction • protected ball-bearings • polyphase and single phase • integral and fractional ratings.



★ MAY WE SEND YOU

BULLETIN 400

BALDOR BALTRIC MOTOR
3-phase and single phase

BALDOR ELECTRIC CO.
4353 DUNCAN AVE., ST. LOUIS 10, MO.

BALDOR ELECTRIC COMPANY • ST. LOUIS 10, MO.

removable section also permitted closer study of the plans, and the addition of notation or alterations if such were necessary.

This arrangement resulted in keeping the prints neat, clean, untorn and uncreased. It also saved time in rolling and unrolling prints, kept the prints handy, and kept the bench top unobstructed and constantly available for other purposes.

Bolt Case Cuts Job Costs

SHOP TECHNIQUES

Have you ever had one of your electricians call up the shop and ask for a couple of bolts or screws to finish up a job? Or send his assistant around to pick up the items? Or pick them up next morning and make a call-back? Chances are good that the mechanic spent a considerable amount of time sifting through his tool box or the material carton looking for the missing items before he made the embarrassing call to the shop. Such a situation is frustrating to the mechanic and irritating to the contractor who has to pay his men better than five cents per minute for these fruitless searches.

Like many electrical contractors, Gould Electric Company of Chicago experienced this many times. Too many, in fact, for owner Elton Gould. He decided this was a problem of shop organization—the material should have been on the job site and accessible to the mechanics. To eliminate recurrence, he designed and had constructed some 50 bolt cases. Each is equipped with about a \$10 inventory of miscellaneous fastening items (bolts, nuts, screws, clamps, toggle bolts, etc.). Now, a bolt case goes on every job, regardless of size. And the electrician who calls back for any of the items contained therein, must have a good excuse.

The special bolt box is made of $\frac{1}{2}$ -inch wood sides with a $\frac{1}{2}$ -inch plywood cover and bottom. The case is $21\frac{1}{2}$ in. long; $9\frac{3}{4}$ in. wide and 1 in. deep (inside dimension). Metal-reinforced outside corners help it withstand rough handling. The inside of the box is divided into 21 eggcrate partitions, each about $2\frac{1}{4}$ in. square, by means of interlocked fiber dividers. Partitions are flush with the sides of the box so that, with hinged cover closed, the box can be turned in any direction without having contents of one division spill over into the next one. Two spring catches hold the cover securely in closed position under all conditions.



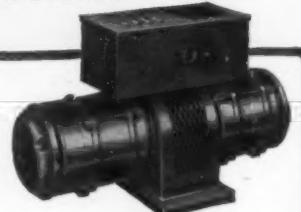
Baldor ADJUSTABLE SPEED MOTOR SYSTEM

DELIVERS SPEEDS

from 0 to 2400 r.p.m.
in 16 steps of 150 r.p.m.
each forward or reverse

The BALDOR Simplified Adjustable Speed motor system operates from A.C. circuits; delivers speeds from 0 to 2400 rpm., with instant, smooth acceleration to each higher speed; instant, smooth dynamic braking to lower speeds or stop. Reverses instantly—even from full forward to full reverse. Separate components—mount in any position or distance apart. SIZES: to 3 h.p. for 2 or 3 phase operation; to $1\frac{1}{2}$ h.p. for single phase operation.

ASK FOR
BULLETIN No. SP-6



POWER UNITS



DRIVE MOTOR

BALDOR ELECTRIC COMPANY • ST. LOUIS 10, MO.



it's new! the oval-cover, flat-back Pyle

The new "OR" series Pylets, with interchangeable features, will meet all electrical conduit fitting requirements for **machinery wiring . . . plant maintenance . . . and new construction.**

- Accurate, ferrous alloy casting.
- Tapered, machine cut threads.
- Large, flat back area, easily drilled for secure mounting.
- Roomy, smooth interior facilitates wire pulling.
- Well-rounded edges prevent wire damage.
- Self-retaining cover screws.

Sold only through authorized distributors.
Write for bulletin and names of distributors in your area.



THE PYLE-NATIONAL COMPANY

1344 North Kostner Avenue, Chicago 51, Illinois

District Offices and Representatives in Principal Cities of the United States and Canada

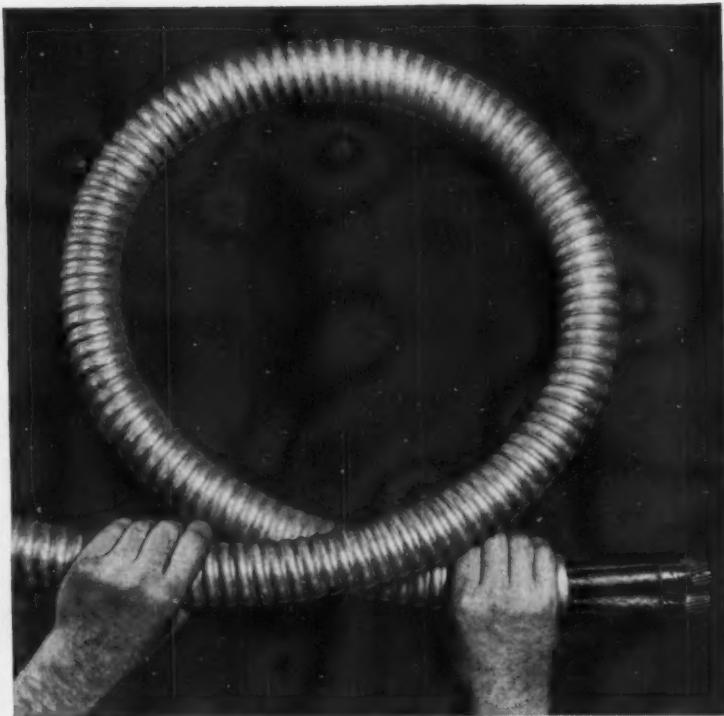
CONDUIT FITTINGS • PLUGS AND RECEPTACLES • LIGHTING FIXTURES • MULTI-VENT AIR DISTRIBUTION



A lightweight aluminum trough is sufficient support for G-E V-c interlocked armor cable. Use troughs for long runs of single cable and keep splicing to a minimum. All splices are a simple mechanical job done right on the site.



The cable is always accessible for alterations and additions. Use racks for multiple runs of large cable and baskets for small cables. The cable is easy to string and can often be pulled by hand around bends and angles.



G-E V-c interlocked armor cable is easily bent around sharp corners and projections. The system weighs only about a third as much as most cable systems. There is an easy method of installation to meet any condition.

This lightweight, flexible G-E cable SPEEDS INSTALLATION of feeder systems



Support single cables by messengers attached to existing buildings and beams for low-cost runs between buildings and across open plant areas.

The light weight and extreme flexibility of G-E V-c interlocked armor cable systems make them adaptable to all wiring conditions. Right angle bends, long runs and close-quarter installations are easier to make and cost less than conventional cable and conduit. Using G-E V-c interlocked armor cable assures your customers of long-lasting, trouble-free feeder systems. *To our knowledge, no installation of interlocked armor cable has ever suffered mechanical damage sufficient to cause electrical failure.*

For more information on the ease of installation and the economies of using G-E V-c interlocked armor cable, write Section W131-1018, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product



GENERAL  ELECTRIC

FOR MORE INFORMATION ON
**NEW PRODUCTS
CATALOGS, BULLETINS
ADVERTISEMENTS**

USE THESE CARDS 

● **PRODUCT NEWS, PRODUCT BRIEFS:**

Use first line of boxes. Insert item numbers of products on which more information is desired.

● **CATALOGS, BULLETINS AND ENGINEERING DATA:**

Use second line of boxes. Insert item numbers of literature desired.

● **ADVERTISEMENTS:**

Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT...

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP

Please send me without obligation further information about the following: 10/54

Product News and Product Briefs, Item Number

<input type="checkbox"/>						
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Catalogs and Bulletins, Item Number

<input type="checkbox"/>						
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Advertisement on Page

<input type="checkbox"/>						
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication

NOT GOOD AFTER DECEMBER 1, 1954

Please send me without obligation further information about the following: 10/54

Product News and Product Briefs, Item Number

<input type="checkbox"/>						
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Catalogs and Bulletins, Item Number

<input type="checkbox"/>						
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Advertisement on Page

<input type="checkbox"/>						
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

NAME..... TITLE.....

COMPANY.....

ADDRESS.....

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication

NOT GOOD AFTER DECEMBER 1, 1954

Your Name and address are photographically reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

PLACE 26
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N.Y.

PLACE 26
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N.Y.

Your Name and address are photographically reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

FOR MORE INFORMATION ON

NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

◀ USE THESE CARDS

● PRODUCT NEWS, PRODUCT BRIEFS:

Use first line of boxes. Insert item numbers of products on which more information is desired.

● CATALOGS, BULLETINS AND ENGINEERING DATA:

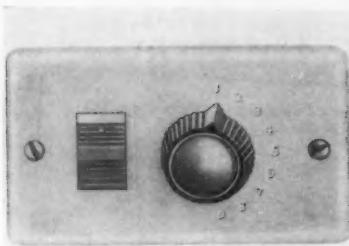
Use second line of boxes. Insert item numbers of literature desired.

● ADVERTISEMENTS:

Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT...

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP



Multi-Control Wiring System (7)

A new low voltage multi-control wiring system for controlling lighting and appliance loads in the home. Through the use of small relays, which are actuated by low voltage switches, lighting and appliance circuits may be controlled from one or any number of desired locations. Another feature is the master switch control. One or more master switches may be installed at strategic locations for the control of any number of circuits. Multi-control may be used as an entirely new system or to supplement existing wiring. System utilizes a magnetic relay operated by low voltage switches to control loads. Relay operates on 24-volt current. Master selector switches permit control of numerous circuits from centrally convenient locations. Literature is available.

Bryant Electric Co., Box D, Barnum Station, Bridgeport 2, Conn.



Lighting Unit (8)

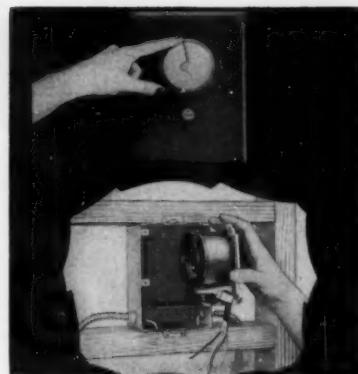
Omega-Plex, one in the series of the Wakefield geometrics, is a complete unit ready for on-surface mounting. The ballasts and lampholders are in an individual metal housing that provides hook-on suspension points for the rigid-arch diffuser. Diffuser is molded with a sweeping arch, slightly higher in the center than at its edges. It has a non-specular, matt finish which minimizes possible reflected glare from outside the building. Omega-Plex is also available with louvers. It is mounted directly on existing ceiling, with no required structural changes. Unit may be used individually, or combined in a variety of lighting designs. Width dimensions are to the exact inch module. Available in 2-ft by 2-ft, 2-ft by 4-ft, 1-ft by 4-ft, and 4-ft by 4-ft sizes. Literature is available.

F. W. Wakefield Brass Company, Vermilion, Ohio

Generator (9)

A new low-cost dc tachometer generator designed for a variety of control applications, provides an unusually high voltage output of 50v/1000 rpm for speeds up to 5000 rpm, and 100v/1000 rpm for speeds up to 2500 rpm. Industrial applications include measuring and controlling speed in the manufacture of steel, aluminum, and paper, and on textile machinery, wire-forming machines, machine tools and many others. It is totally-enclosed, can be either flange or foot mounted to be direct-coupled, geared or belt-driven. Capable of being mounted horizontally or vertically, the unit is equipped with a conduit box with a $\frac{1}{2}$ -in. straight pipe thread which permits conduit if desired.

General Electric Co., Schenectady 5, N. Y.



Luxtrol provides a full range of illumination suited to individual needs and occasions. A change of the knob can vary the color scheme, rearrange accents or alter the entire tone and mood of a room. Safety is assured through the double protection of a fuse and a bimetallic thermal overload relay. If a lamp burns out or is removed from the line, dimming of the others is in no way affected. In addition to use in the home, it is ideal for installation in churches, hotel rooms, restaurants and cocktail lounges, small auditoriums, offices, stores and show windows.

Superior Electric Company, Bristol, Conn.



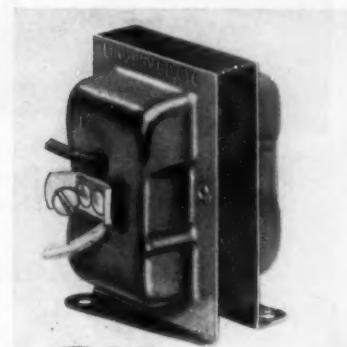
Terminal Lug (10)

Universal pressure type adjustable terminal lugs are available in six sizes, from No. 14 to 1,000,000 CM. Body is proportioned to withstand excessive use, with ample thread area. Makes grip on stranded conductors, forcing contact with each wire in strand, thereby insuring utmost in conductivity, bottom of tongue surface is ground. They are moisture resistant, and unaffected by vibration.

Krueger & Hudepohl, 5 East Third St., Cincinnati 2, Ohio.

Light Control (11)

"Luxtrol", a new development in home light control, permits the setting of the light intensity of lamps to any value from complete darkness to full brightness. Each unit, operating on the dimmer principle used in theaters, can handle any number or combination of lamps, colored or uncolored, up to a load of 360 watts. It can be wired into new or existing circuits. Essentially, the unit is a 360-watt variable autotransformer operating on 120-volt ac. A movable brush contact rides on a bared portion of the winding. Rotating the contact arm by turning the knob produces any desired light intensity. A switch is incorporated at the blackout position to shut off entire circuit. Only current required to produce desired illumination is used. At the turn of the knob control,



Transformer (12)

The "Silent Watchman" is the exclusive bi-metal thermal switch which prevents burn outs caused by overload of short circuit in the line. The thermal switch, uses a contact lead made of two thermal or dissimilar heat-sensitive metals. Heat due to overload or short circuit in the line causes heat-sensitive metal contact leaf to expand and overcome pre-set spring tension. This makes the contact open and close until the trouble has been corrected. Included in the transformer line are the 10-volt 5-watt bell type Style 510 for bells and buzzers and chimes in small apartments; the 16-volt Style 101-OB, which mounts anywhere and can take substantial surge loads; the 24-volt Style 201-OB, for higher loads, and 8-16-24 Trivolt, Style 320, which is an all-purpose, low-voltage transformer.

NuTone, Inc., Madison & Red Bank Rds., Cincinnati 27, Ohio



easy to splice

Splicing Okolite-Okoprene rubber-insulated shielded cables is a simple and easy operation. No lead wipe is required, nor is a filling compound necessary. The fewer man hours required mean a lower cost splice and more rapid installation. Important, too, moisture present in underground installations will not affect the tapes used in this permanent splice. Ease of splicing is another reason why the switch today is to Okolite rubber-insulated cables for high voltage use.

• Splicing Okolite-Okoprene at a large southern chemical plant.

WHY THEY'RE SWITCHING TO OKOLITE

There is a distinct trend among industrials and public utilities toward Okolite rubber-insulated cables for high voltage use.

ADVANTAGES

1. Lighter and easier handling.
2. Eliminates sheath corrosion and fatigue.
3. Simplifies splicing and terminating.
4. Moisture does not affect the insulation.
5. No oil migration at high temperatures or elevations.
6. Flexibility simplifies installation.

APPLICATIONS

1. Transmission and distribution circuits.
2. Generator and transformer leads.
3. Vertical risers and shaft cables.
4. Submarine power cables.
5. Portable substation cables and test leads.
6. X-ray cables.

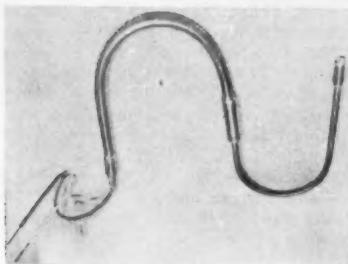
Send for this 128-page manual on rubber-insulated high voltage cable. It provides current carrying capacity tables, dimensional data, engineering information and installation procedures, complete instructions and detailed drawings for splices and terminations. Write for Bulletin EC-1075 on your letterhead to The Okonite Company, Passaic, New Jersey.



OKONITE OKONITE SINCE 1878 **insulated cables**



Product News



Electric Heater

(1)

A new electric heater which makes use of copper sheathed, mineral insulated, resistance cable and called "Nelex" mineral insulated heater units, has been developed. Units are sold in either standard or special lengths. Designed to operate at temperatures up to 500° F. in open air, working temperatures of 1000° F. can be tolerated when heater is immersed in liquids to exclude oxygen. Hermetically sealed at factory, heater can be immersed in any liquid not harmful to copper or it may be imbedded in concrete or earth.

Flexible construction of heater provides physical strength to withstand the abuse, corrosion, vibration and shock of industrial use. Because of its annealed copper sheath it can be formed to fit irregular shapes and surfaces.

"Nelex" heaters provide a clean, uniform and rapid heat that can be used in a wide variety of applications in industrial, commercial, rural and residential areas. Some of the typical uses are for surface heating of metals; pipe line heating, either external or internal; liquid heating; compound melting and heating; and deicing and freeze prevention.

For use with these new heater units, a line of thermostats of similar construction and designed to withstand the same conditions as the heaters has been developed. Bulletin No. 1603 is available.

Nelson Electric Mfg. Co., 217 No. Detroit, Tulsa, Okla.



Connector

(2)

A flexible braid connector that features a protective vinylite covering. Made of extra-flexible, flat, tinned copper braid with seamless copper ferrules on each end, the new insulated connector provides protection against corrosive atmosphere and abrasive particles. The entire braid

section is covered with vinylite and secured within the ferrules by compression. The new connector is especially suited to plating operation applications.

Burndy Engineering Co., Inc., Norwalk, Conn.

Electronic Circuits

(3)

"Packaged" electronic circuits give greater protection to electronic elements in the controls, and facilitate ease and speed of maintenance. They function as the "building-blocks" of which the control as a whole is constructed. Each contains its own electronic circuit for its own particular purpose. The packages are mounted on the panel, each separate and independent from the other. The units are pre-tested, contain high-reliability amplifier tubes, and are interconnected by attaching leads to screw-type terminals. Components are sealed in plastic, and encased in a metal enclosure. In case of emergency needs, the Sealpaks will operate on radio-television tubes.

Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio.

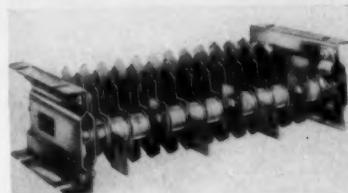


Instrument

(4)

A new wide range pocket size volt-ammeter for measuring alternating current and voltage. Designated AK-4, it measures 9 1/8-in. by 3 1/8-in. by 1 1/8-in. and includes 150/300/750 volts ac as its volt ranges. Capable of measuring current on both insulated and non-insulated conductors without cutting conductor or interrupting work, unit is equipped with scales that automatically change when the range selector knob is turned. Current range of 10/30/100/300/800 amps ac provides for the measurement of currents usually encountered in industrial or commercial circuits. The volt-ammeter operates on 60 cycles with a 3% full scale accuracy. Its hook-on assembly consists of a toroidal wound split-core current transformer with directionalized steel laminations.

General Electric Co., Schenectady 5, N. Y.

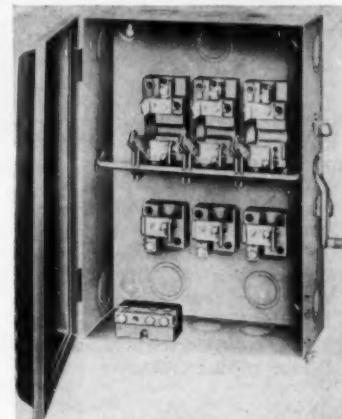


Resistor

(5)

New Bulletin 11011 non-breakable, all welded mill type grid resistor has been announced. It has the exclusive "draw-out" feature. As a unit, the complete grid assembly can be withdrawn from its frame without disturbing the grid box end frames or other boxes in the resistor stack. A different type of grid rod and end plate construction automatically compensates for thermal expansion of the individual grids. Welded current carrying junctions provide a continuous unbroken path for constant resistance values. Individual grids are non-breakable, punched from a chromium steel alloy, and mounted in an unique under arrangement to attain efficient heat radiation. Continuous current capacities up to 180 amperes per box in ratings from 1/10 to 10 ohms are available. All grids are insulated for 600-volt.

Cutler-Hammer, Inc., 228 North 12th St., Milwaukee 1, Wis.



Safety Switch

(6)

A new 200-amp type D safety switch, companion to the new 100-amp switch. They are side operated, and feature a quick break, and accelerated make. Other special features include visible blade construction, ample gutter space on each side for easy wiring, new patented fuse holder, and optional use of solder or crimp type lugs. Designed for residential and commercial applications such as lighting and appliance loads.

Federal Pacific Electric Co., 50 Paris St., Newark, N. J.

Look to the Leader
KLEIN
for Quality

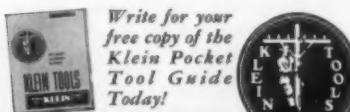


HERE'S SAFETY—SERVICE

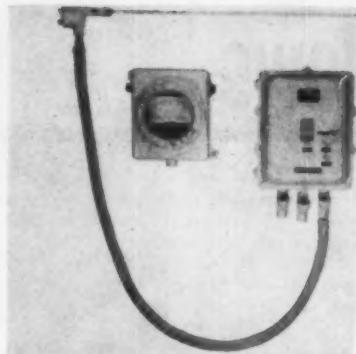
you can always depend on. For Klein tools and equipment are designed better for your jobs—made of the finest materials—individually tested and inspected. Look for the familiar Klein trade-mark—serving the electrical industry "since 1857."

ASK YOUR SUPPLIER
Foreign Distributors

International Standard Electric Corp., New York



Mathias **KLEIN** & Sons
Established 1857
1200 BELMONT AVE. CHICAGO 18, ILL.



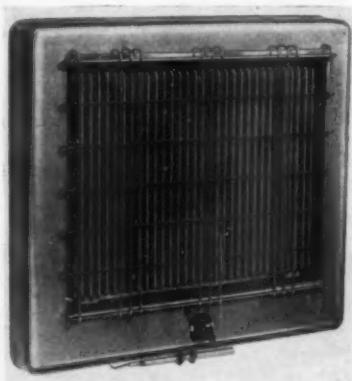
Level Indicator (13)

Electronic level indicators in specially-designed explosion-proof cases for installation in hazardous areas. Explosion-proof Telstors have been produced to meet requirements of the NEC, Article 500, in Class I, Groups C and D; and Class II, Groups E, F and G. They are available in several combinations suitable for many different industrial and laboratory applications. They employ the standard Telstor continuous level indicator, which is a one-tube, electronic unit for measuring mass or level of liquids, viscous fluids, powders and granular solids, regardless of whether they are conducting or non-conducting.

Fielden Instrument Div., Robertshaw-Fulton Controls Co., 2920 N. Fourth St., Philadelphia 33, Pa.

and with the flick of the dial you are connected with your party. The exchange, about the size of a small hat box, handles all the operation normally requiring a switchboard and its operator. System requires but two wires from each phone station to exchange. Power is supplied by plugging exchange into any 110-volt ac outlet. Primarily designed for intercommunication, exchange can be tied in with trunk lines wherever telephone company permits. In conjunction with trunk tie-in, a system of hold and transfer service for incoming calls can be incorporated. Other optional features include remote control operation for Bliss PA25 quick-heat amplifier, busy signal with "gentle hint" to talking parties, and expansion facilities from standard 10 up to 40 or more lines.

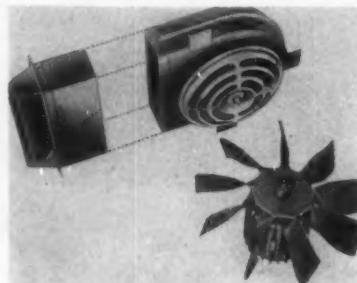
Bliss Electronic Corp., Sussex, N. J.



Electric Heating Panel (16)

A new wall-type electric heating panel which combines the principles of both radiant and convection heating. Scientifically designed radiation fins of cast-aluminum which provide free flow of heated air, and special deflector channels which force the heat outward, permit secondary air flow, and keep wall cabinet cool. It is available in automatic models with built-in thermostat or in manually controlled models. Used throughout the home, it provides a complete heating system, and is for use in added rooms, sun porches or any hard-to-heat room. It is rated at 1100 watts, 3753 Btu, and is available for 120 or 240 volts. Overall dimensions are 21-in. wide, 17-in. high, and 2 3/4-in. deep. Literature is available.

Electromode Corporation, Rochester 3, N. Y.



Ventilating Fan (14)

New design of the 10-inch Ceil-N-Wall ventilating fan resulting in improved performance at lower noise level. Model 1021, with the new 9-petal turbo-radial impeller, embodies the latest design in air moving equipment. It will deliver 530 CFM at highest of 3-speeds through 10 feet of duct. Basic design changes are—air-moving surfaces of impeller have been increased by 50%; and turbulence is reduced between petals of impeller accounting for 40% of total noise reduction. Noise reduction is further enhanced by new inlet ring design.

Fasco Industries, Inc., Rochester, N. Y.

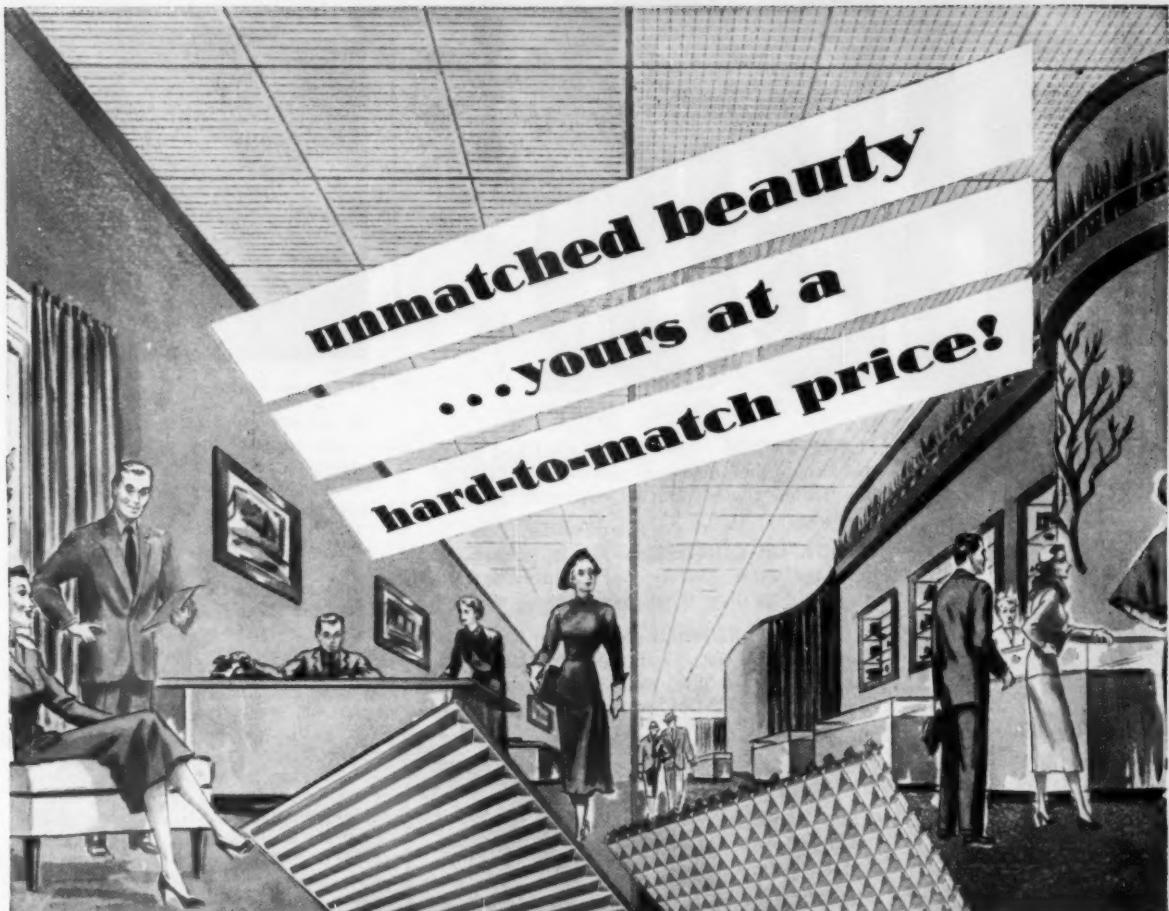
Telephone Exchange (15)

A new automatic dial telephone exchange, which requires no line or cut-off relays, no pushbutton operation, no separate power supplies. Hear the dial tone

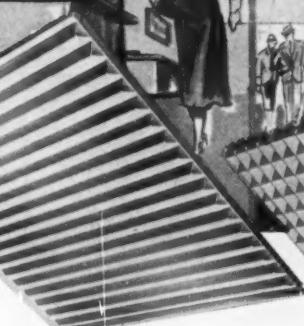
Industrial Solenoid (17)

A new line of strongbox industrial solenoids, designed with an emphasis on complete rating coverage, smaller size, greater flexibility, and longer life. New line also makes it possible to get a complete, even distribution of 24 different ratings from nine basic frame sizes. This distribution is available in both push and pull, dc and ac, 25 to 60 cycles, 24- to 600-volt forms.

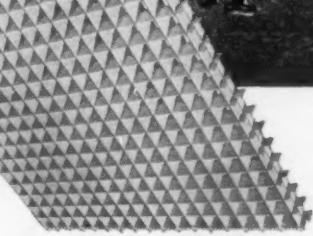
General Electric Co., Schenectady 5, N. Y.



NEW BENJAMIN "PANEL-GLO"



NEW BENJAMIN "SKY-GLO"



You need not forego the many advantages of a Benjamin Luminous Louvered Ceiling... comparative costs show why!

Even when you compare on the simple basis of material and fixture costs alone, it is often more economical to use a Benjamin Ceiling as against conventional individually-hung units. Especially in areas where it is desired to modernize by lowering the ceiling to cover up ugly ducts, pipes or cracks, Benjamin Louvered Ceilings are even more economical. In addition to furnishing higher light-levels, these "ceilings of light" actually modernize old-fashioned store areas, school-rooms, offices, etc. to make them "look young again" without plastering or other re-decorating expense.

Send for FREE "Sky-Glo" and "Panel-Glo" Data Bulletin. Benjamin Electric Mfg Co., Dept. H Des Plaines, Illinois.

NEW Simplicity brings down installed price!
New, practical, easy-to-handle 3' x 3' translucent panels or louver sections.

NEW, Easier Installation brings down installed price!
No need to order "fill-in" size panels. Trim them yourself with scissors... right on the job... to the exact shape desired! New metal FINISHING STRIPS neatly hide trimmed edges on either louver or luminous-panel jobs.



NEW, proven TRANSLUCENT plastic material means
MORE LIGHT with CONTROLLED BRIGHTNESS.
(Same material used for "Sky-Glo" and "Panel-Glo.")

Benjamin "Sky-Glo" and "Panel-Glo"
Ceilings are approved by
Underwriters' Laboratories

NOW, figure the complete price of a ceiling-lighting job by the sq. ft.

Sq. ft. price includes all panels or louver sections as well

as all the channels, fittings, etc. you need to complete the installation!*

No calculating, no figuring... just know the area of the room!

No layouts necessary for regularly-shaped rooms.

* lighting equipment not included.

BENJAMIN *Lighting Equipment*

sold exclusively through electrical distributors
B-625J.

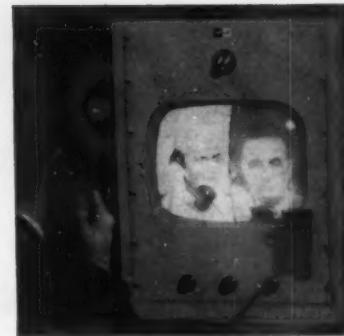
PROOF

- * **FLAME-PROOF** — Bronco 60 Certified bears the flame-proof approval number P116BM of the United States and Pennsylvania Bureaus of Mines.
- * **PROOF OF CONTENTS** — Jacket is *certified* by a registered professional engineer to contain not less than 60% Neoprene by weight.
- * **PROOF IS BRANDED** — "... 60% Neoprene by weight ..." is vulcanized into the jacket along with type, size, number of conductors, voltage, and "P116BM" every two feet.
- * **OIL-PROOF** — The rich Neoprene jacket of Bronco 60 Certified will not swell and crack when doused in oil.
- * **OZONE-PROOF** — Around electric motors and generators Bronco 60 Certified resists attack of ozone.
- * **SUN-PROOF** — Rays of the sun can't break it down. In fact, Bronco 60 Certified is proof against all of rubber's natural enemies.



Sold nationally only through leading Electrical Wholesale Distributors

WESTERN INSULATED WIRE CO. LOS ANGELES 58, CALIF.



Intercom System

(18)

Kay Lab's television telephone intercom system, referred to as TV-T, resembles a conventional 17-in. television receiver with a telephone handset beside the screen. In making a TV-T call, the telephone receiver is lifted from its hook. The caller's image appears simultaneously on one-half of his screen and on one-half of the screen of the called party. When the latter answers, his image is shown on the remaining half of each screen. A simple adjustment enables either party to make the entire screen area available for a variety of uses, such as viewing signatures, blue prints, documents, miscellaneous articles, and the like. When set is not in use as TV-T intercom, the screen may be utilized for monitoring an industrial closed-loop television system, for receiving subscription television, or for taking programs from the air in the same manner as a standard television receiver. TV-T is designed primarily for industrial application, but can also be used in banks, department stores and other operations. As many TV-T intercom stations as desired can be installed in a single system.

Armstrong-Schramm Co., 548 Spreckels Bldg., San Diego 1, Calif.



Motor Control Centers (19)

A new line of motor control centers, known as DA7093. Units will take nine NEMA Size 1 starter units, or six NEMA Size 2 units in the standard 90-inch trough without reduction in pull-box space. Starter units will be of either fusible or circuit breaker types. A new center bussing arrangement frees pull-box

space for wiring and increases vertical bus capacity from 300 to 600 amps. This same arrangement also makes available continuous main buses of 600- or 1200-amp capacity in standard construction up through five sections. Trough is designed to take straight-in wiring to main lugs. A separate insulator is furnished for each bus. Main buses are mounted in an edge-to-edge arrangement and vertical bus bars are spaced on 5-in. centers. Incorporated in the DA-7093 are newly designed split Type "B" terminal blocks which allow starter units to be removed or inserted without disturbing wiring. A new method of grounding has been developed. Cadmium-plated gliders, mounted on underside of each unit, ground the unit to cadmium-plated base upon which it rides. This grounding occurs before the unit engages the bus bars. The same cadmium-plated base upon which each control unit rests also acts as an isolating barrier. Each standard section measures 13½-in. deep by 24-in. wide.

*Distribution Assemblies Department,
General Electric Co., Plainville, Conn.*



Cable Cutter (20)

Armored electrical cable as well as copper and aluminum conductor to 4/0 AWG, can be cut without a hacksaw by using the new No. 364 cable cutter. The new tool has specially ground and hardened, blunt cutting edges. Its blades are of forged steel with ½-inch overlap, thus allowing repeated sharpening. Together they form a heart-shaped opening which provides a sliding, slicing action that forces the cable toward the tool's fulcrum. After cutting, the cable retains its round shape. Other cutting jobs are: non-metallic sheathed cable; service entrance cable; multi-telephone and communications cable; super service cords; rope and garden hose; flexible conduit; trench-lay cable, etc. up to a maximum diameter of one inch.

Thomas & Betts Co., Elizabeth, N. J.

Cold Cathode Lamp (21)

A new design cold cathode fluorescent lamp which has the electrode concealed in the 25mm glass body of the lamp. Lamp is also equipped with clover leaf contacts, which permits fixture manufacturers to use the same fixture bodies for either slimline or cold cathode lamps. Absence of filaments in lamps makes them ideal for radio or radar installations where radio interference must be avoided. Designated as Voltarc No. EC, lamp is available in standard 8-ft. lengths. Special lengths on request.

Voltarc Tubes, Inc., 44 Cross St., Norwalk, Conn.

- • • •
- FAST, EASY
INSTALLATION
-
- MINIMUM
MAINTENANCE
-
- MAXIMUM
EFFICIENCY
-
- USER
SATISFACTION
-

**ONLY ELECTROMODE
ALL ELECTRIC
HEATERS have all**

3

Triple Assurance With ...

ELECTROMODE'S Advantages Add Up To YOUR PROFIT

Here are some of the many places where ELECTROMODE can be profitably used:

**HARD-TO-HEAT AREAS • FACTORIES •
OFFICES • ISOLATED BUILDINGS •
PUMP HOUSES • METER HOUSES •
WATCHMAN TOWERS • FACTORY
OFFICES • LOBBIES • STORAGE ROOMS
• GARAGES and many other locations.**



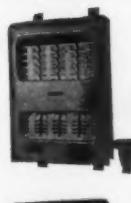
SUSPENSION TYPE

available from 10,000 to 45,000 watts (34,150 to 153,875 btu). Adjustable louvers permit directing heat into working zone. Model 14-10 illustrated.



COMBINATION PORTABLE

and Suspension type. Available from 1500 to 7500 watts (5,122 to 25,613 btu). Adjustable louvers permit directing heat into working zone. Model AN-30A illustrated.



EXPLOSION-PROOF

for heating hazardous areas subject to explosion. Available in three sizes: 2000, 4000, 6000 watts (6830 to 20490 btu). Model CX-2 illustrated.



AUTOMATIC WALL-TYPE

with Down-Flo principle distributes clean, healthful, fan-circulated heat at floor level. Available from 1500 to 4000 watts. Model WA illustrated.

100% SAFE


Hot resistor wires are insulated and embedded within a finned aluminum casting, assuring positive protection from fire, shock or burn. This finned type element acts as a superior heat diffuser, resulting in greater heating economy.

5 YEAR GUARANTEE
The patented, cast-aluminum heating element is guaranteed for five years against all defects of material or workmanship.

The Famous GE UNIT MOTOR

Totally enclosed construction protects motor from entry of dust. Large supply of oil sufficient for years of motor operation is factory-sealed-in. Forced lubrication system assures long life and quiet operation.

SAFETY SWITCH

Built into every Electromode Heater is a small thermal safety switch, located on or near the heating element. If for any reason the air flow should stop, causing overheating of the element, this safety switch automatically shuts off the current.

Approved by Underwriters' Laboratories

ELECTROMODE CORPORATION

Dept. EC-104, 45 Crouch Street, Rochester 3, N. Y.

Please send us your FREE Electric Heating File, containing specifications, illustrations, installations, prices and how to figure electric space heating. We are interested in Electromode Industrial Heaters Electromode Home and Office Heaters Electromode Explosion-Proof Heaters

Name _____

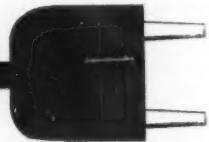
Address _____

City _____ Zone _____ State _____

Mail
Today!

From Kennecott...

121,040,000 reasons why people should do something about their home wiring!



15,130,000 times a month . . . for eight successive months! That's how many appearances ads like the one opposite are making before Saturday Evening Post and This Week audiences!

A total of 121,040,000 hard-hitting salesmen are going out to sell the public on residential re-wiring . . . potentially one of the most profitable parts of your business.

Look at it this way: Surveys show that 80% of the homeowners in your territory need their homes re-wired . . . need larger-sized wires, more

circuits and outlets. The market is waiting and willing. Kennecott's down-to-earth, educational advertising campaign is made to order for it!

This is your cue to jump in with both feet . . . to coordinate your own sales effort with Kennecott!

* * *

Send for **FREE** copies of new consumer booklet, "The ABC of Home Wiring;" free newspaper mat ads, reprints and posters for your own local promotion. Write Kennecott Copper Corporation, 161 East 42nd St., New York 17, N. Y.



MARVELOUS!
Her vacuum
cleaner
finally
cleaned
a rug!

Why couldn't it do that before?

Don't blame it on the vacuum cleaner! It was doing the best it could on a starvation diet! You see, the wires in this lady's house just weren't large enough to carry enough electricity to the vacuum cleaner at the same time they powered her many other electrical needs.

And let's face it, it's 4 to 1 the wiring in your own home is in the same shape! Surveys show that more than 80% of all American homes of today are underwired!

Here's what happens!

How can you tell if your wiring is inadequate? In addition to poorly operating appliances, here are some other symptoms of electrical illness:

Fuses blow out; circuit breakers trip too often; lights flicker, or dim, when appliances are turned on; TV pictures are smaller than they should be.

If your house is 10 or more years old, the chances are that its original wiring cannot carry all the current your appliances now need.

New houses suffer, too!

Even if your house is brand new, its wiring may become overloaded if you add a single new appliance! An air conditioner or an electric broiler, for instance.

What should you do? Why, do what the happy lady in the picture above did! Consult your local electrical contractor. His up-to-date wiring

methods can make the electrical modernization of your home easier, thrifter than you think!

Here's what to do!

If you own a house see your electrical contractor. He will check your needs, estimate costs.

If you plan to buy a house, it's a smart idea to have the capacity of its wiring pre-checked.

If you plan to build, consider the future. Average electrical needs increase 10% yearly!

Many public utilities offer free adequate wiring service. Call yours!

Free Booklet! "The ABC of Home Wiring." Write now to Kennecott Copper Corporation, Dept. S6, Box 238, New York 46, N. Y.



Published for your information by

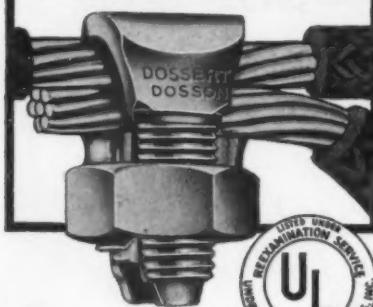
Kennecott
COPPER CORPORATION

Fabricating Subsidiaries: CHASE BRASS & COPPER CO., KENNECOTT WIRE CO.

This advertisement, appearing in SATURDAY EVENING POST and THIS WEEK, will reach more than fifteen million readers. It is only one of a regular series of Kennecott advertisements aimed at educating the public to the importance of adequate home wiring.



NEW! DOSSON "F" SPLIT BOLT CONNECTOR



For:

taps, dead-ends, service entrances, motor leads, junction boxes, ground wire-to-neutral connections

Fabricated from high strength alloys, all component parts of the new Dosson "F" Connector are cold formed, insuring consistent uniformity and high quality. Can be used economically over and over again!

Why It's Your Best Bet:

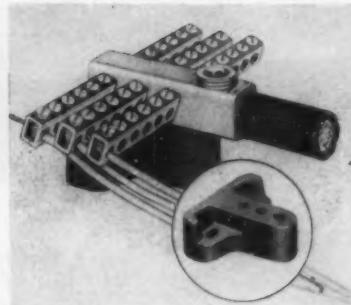
- high clamping pressure insures tight contact
- maximum tightening force: high translation of tightening torque
- connector alloys possess greater physical properties than average steels
- longer bearing pressure bars avoid conductor crushing, load concentration
- smooth edges can't cut lineman's gloves, nick conductors
- withstands high overload, vibration, corrosion



FREE SAMPLE
upon request.
Write today!

IN STOCK FOR
IMMEDIATE
DELIVERY

DOSSETT REPRESENTATIVES IN PRINCIPAL CITIES



Neutral Bar

(22)

By forging the circuit bars into the main line connectors at a 20° angle for easy wire insertion of every branch circuit wire CAN neutral bars have been developed into units of unusual strength and adaptability. Illustration shows unit on a plastic block to be used for mounting. Also available without mounting block. Features are: can be used in limited space; wires are not crossed but connections are made parallel to each other; no spreading of wires away from screw head; washer head screws are eliminated; wires are inserted in V-shaped hole when screw is pulled down; larger wire range is offered as circuit taps take No. 14-6 and main line load is 250MCM-6.

Ilco Copper Tube and Products, Inc., Mariemont Ave., Cincinnati 27, Ohio



Lighting Fixture

(24)

A new pendant type of vapor-tight lighting fixture for industrial use designated type "BOB". An annular slot between the reflector and body permits convection currents around glass globe to flow upward and escape instead of recirculating under reflector and thereby deposit excessive dirt on reflecting surface. A series of vertical fins are cast integral with body to radiate heat and to create convection currents over exterior surfaces. The body is conically shaped. A two-piece porcelain mogul screw base lamp receptacle simplifies wiring as one piece is removable for access to wire terminal screws of receptacle base. Available with dome, deep bowl and 30-degree angle reflector.

Pyle-National Company, 1344 N. Kostner Ave., Chicago 51, Ill.



Fan Heater

(23)

A new low wattage wall heat fan is available. Separate switches for fan and heat are located near top of heater and a neon indicator light glows when heater is working. It is for use in small rooms such as dressing rooms, nurseries, dinettes, dens, etc. Unit has a louver grille which forces the flow of warmed air downward to warm a room from the floor up, with less heat waste at ceiling level. Resistance coils are Nichrome wire and fan action induces constant air flow over coils preventing oxidation and deterioration through red glow and maintaining even "black heat". The heavy-duty motor is a single-phase induction type and the 4-blade fan is dynamically balanced. Thermostatically controlled heaters offer the same features as manually



Cable Inspector

(25)

This new cable inspector is an automatic electrical wiring inspection system based on continuous scanning circuitry developed for the chemical processing industry. One feature is automatic resistance measurement. Conductors are scanned at the rate of one per second. Standard unit is capable of checking insulation resistances to 110 megohms at

This **FREE RLM BOOK** brings you valuable information on the Proper Specification of Industrial Lighting Equipment



provides you with Specification Data covering

4 ESSENTIALS to GOOD LIGHTING EQUIPMENT PERFORMANCE

and the names of manufacturers from whom you can secure such equipment

These are the 4 ESSENTIALS TO GOOD
LIGHTING EQUIPMENT PERFORMANCE
ASSURED BY THE RLM LABEL:

1. High Light Output—to assure you of
MORE LIGHT FOR YOUR MONEY
2. Proper Shielding—to assure you of
**MAXIMUM PROTECTION FROM
HARMFUL GLARE**
3. Quality Construction—to assure you of
MINIMUM MAINTENANCE COSTS
4. Uniform Quality from fixture to fixture
—to assure you of **UNIFORMLY
SATISFACTORY RESULTS** throughout
the lighting system

● Everyone who buys, sells and specifies industrial lighting equipment should have a copy of this helpful 52-page reference work. It contains nationally-recognized standard specifications for 75 types and sizes of industrial lighting units. Each one of these specifications incorporates the first three of the four "Essentials to Good Performance" listed at the left.

The RLM Specifications Book also explains fully why the RLM Label on lighting units is a Warranty for Uniform High Quality. It points out why you can rely on RLM-Labeled units of the same manufacturer to maintain a certain quality level within

your lighting system. Knowing that you can depend on such uniform quality, saves time, money and labor, in terms of such factors as uniformity of illumination, minimum service interruptions, low operating and low maintenance costs.

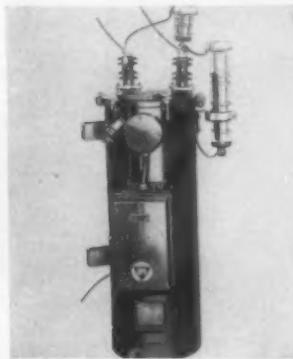
Also included with this free book is a list of the manufacturers who make RLM-Labeled lighting units. Act now to get up-to-date on proper specification of lighting equipment that assures you of 4 Essentials of Good Lighting Equipment Performance! Send for your free copy of the RLM Specifications Book. RLM Standards Institute, Suite 819, 326 W. Madison St., Chicago 6, Ill.

R741



350-volt dc. This sensitivity is achieved by an electronic leakage detector. In addition, the inspector is used to locate direct shorts and automatically "ring-out" multiple circuits. It can automatically identify individual wires in multiconductor cables, conduit, wireways and terminal boxes. Inspector consists of two portable units: Master and Slave. Master unit incorporates the operating controls and adjustments and is used for all inspection functions. Slave unit is used in conjunction with the Master for identification of cable circuits only. The two units are self-contained, operating on 115-volt, 60-cycle power supply. Case dimensions are 24-in. by 6-in by 14-in.

Panascan, Division of Panellit, Inc.,
7449 N. Hamlin Ave., Skokie, Ill.



Rural Regulator (26)

A new single-phase rural regulator, having four 2.5% steps. The unit, designed for pole mounting, incorporates a tap-changing mechanism, a tap position indicator which is readable from the ground, round-wound core and coil assembly in ORTO, and a voltage control which may be mounted on pole base or tank. A lightning arrester is provided across the series coil. Regulator is available in 14- and 25-amp sizes, of 7620 volts, for use on multi-grounded wye circuits of 7.62/13.2, 7.2/12.47, 7.96/13.8, or 6.9/11.95 kv. A common ground terminal is provided on tank.

Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

Magnet Brakes (27)

A complete new line of dc magnet brakes featuring reduced maintenance, easy single-point adjustment. They are used for heavy duty applications in mill drives, materials handling, marine service, ice, and on bridges. The line will cover the standard's 8-, 10-, 13-, 16-, 19- and 23-inch diameter wheels. The brake has a self-contained strongbox coil which can be changed without removing the whole magnet assembly. Also, the wheel can be removed from the top without disturbing any of the other adjustments, and the shoe linings can be replaced without removing brake shoe assembly.

General Electric Co., Schenectady 5, N. Y.

THE FACTS OF LIGHT

and THOMPSON
Servisafe
POLE UNITS

FACT NO. 1: ONLY "SERVISAFE" UNITS PERMIT GROUND LEVEL MAINTENANCE FOR POLE-MOUNTED LUMINAIRES. A disconnecting and lowering hanger mechanism allows workman to lower luminaire for servicing and then reposition it with minimum effort and complete safety.

FACT NO. 2: ALL SERVICING HAZARDS ARE ELIMINATED. Workman has both feet on the ground and both hands on the job at all times. In addition, lowered fixture is "dead" because live contacts remain at pole top.

FACT NO. 3: SERVICING TIME AND COSTS ARE REDUCED TO MINIMUM. One man, using only a light vehicle, now can maintain pole-mounted luminaires in a fraction of the time formerly required. Faster servicing and elimination of costly auxiliary equipment assures substantial savings as well as increased lighting efficiency.

FACT NO. 4: "SERVISAFE" POLE UNITS ARE SUPPLIED AS COMPLETE PACKAGES READY FOR WIRING AND ERECTING. Featuring decorative as well as functional qualities, both single and double-arm models can be furnished with a variety of new steel and aluminum poles. "Servisafe" Bracket Units for wall and wood pole mountings also are available.

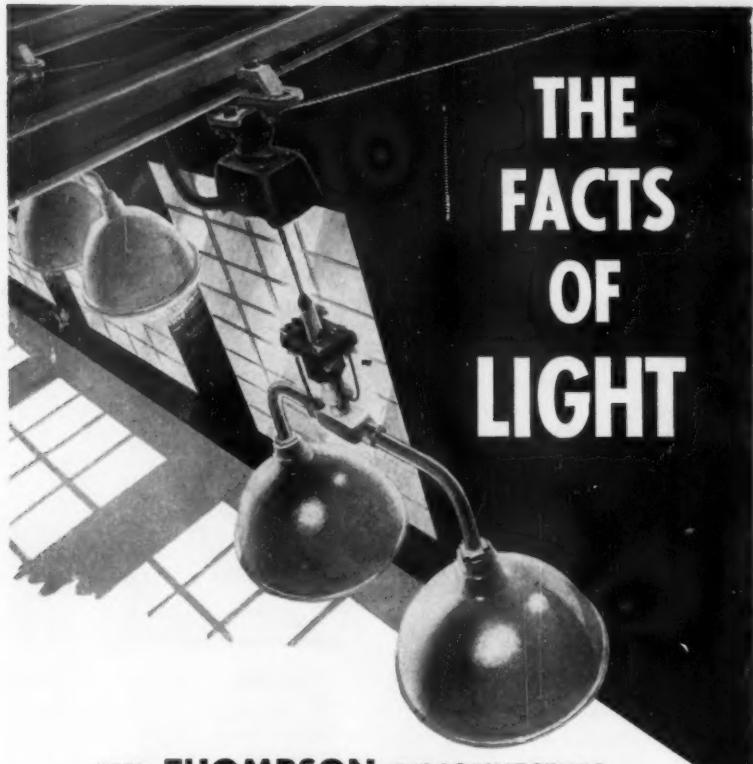
5080-TE

Write for Bulletin WPH-54 for additional details.

THE THOMPSON ELECTRIC CO.

1157 POWER AVENUE

CLEVELAND 14, OHIO



THE FACTS OF LIGHT

... AND THOMPSON DISCONNECTING AND LOWERING HANGERS!

FACT NO. 1: Around-the-clock plant efficiency requires regular planned maintenance of lighting equipment.

FACT NO. 2: Only high-bay lights suspended from Thompson disconnecting and lowering hangers can be serviced easily and safely... at floor level.

FACT NO. 3: Plants equipped with Thompson hangers are setting records in safety. No ladders, scaffolding or hazardous practices are needed for luminaire maintenance... one man quickly cleans and relamps lowered fixture while standing on the floor. Electrical dangers are eliminated by Thompson hangers because lowered fixtures are "dead".

FACT NO. 4: Thompson disconnecting and lowering hangers cut maintenance costs by saving man hours... reducing accidents. One man can clean four times as many Thompson hanger-equipped lights per hour as two men servicing fixed-position lights by means of ladders or scaffolds.

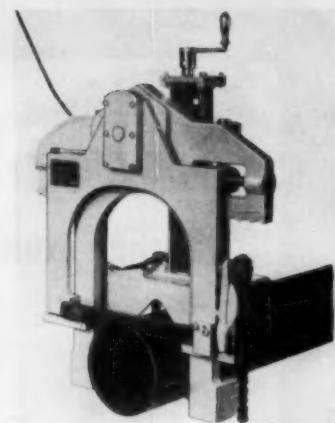
To learn the complete facts of light, write today for the new illustrated BULLETIN TH-52.

1-608-118



THE THOMPSON ELECTRIC CO.

1157 POWER AVENUE • CLEVELAND 14, OHIO



Power Saw

(28)

A portable power pipe saw for on-the-job cutting of 2-in. to 8-in. cast iron and steel pipe as well as bar stock and beams. It weighs 120 lbs. and operates in a space 25 inches wide. Chain pipe vise clamps Guillotine saw to pipe, ready to cut, in a matter of seconds. Machined cast steel V saddle base assures a square cut at right angle to pipe. Available with electric or air motor.

E. H. Wachs Company, 1525 N. Dayton St., Chicago 22, Ill.



Starter

(29)

Air thermal fluorescent starter, called "Instamatic", fits all standard, starter type fluorescent fixtures. Its operating principle is based on air thermal action and no glow switch tube is employed. Other advantages are: automatic cut-out, automatic reset; saving in power consumption; one cycle positive starting; operates under extreme conditions (voltages as low as 93 volts, temperatures minus 50° to 135° and on ac or dc current).

Verd-A-Ray Corporation, 615 Front St., Toledo, Ohio



Transformers

(30)

Newly developed tap changers for de-energized operation are now standard equipment on large Allis-Chalmers transformers. Principal features of mechanism are the design of its contact area and a flexible action which maintains equal pressure on moving members to make them self-aligning. Springy arms hold a pair of rounded, movable, solid copper bridging contacts against a cylindrical shaped stationary contact. Contacts are

G&W Oil Fuse Cutouts

Protect men and equipment



The type "FC" oil fuse cutout is primarily intended for fusing or switching primary circuits in underground or overhead installations. The cast steel tank (hermetically sealed and oil filled) provides maximum protection by safely withstanding the high pressures created when the high voltage fuse clears a heavy short circuit.

The switching contacts are beryllium copper. Fuse links are simple and inexpensive, easily replaceable in the carrier on the removable cover of the tank.

Welded steel boxes with cutouts on top, enclose connections to feed and load circuits.

The gang operating mechanism provides for three phase load break switching.

RATINGS

Size	Volts	Amperes
FC31	2,500	100
FC42	5,000	200
FC62	8,000	100

Bulletin CA52 gives data and prices. Write for copy or ask your representative.

G & W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois
Representatives in principal cities of U.S.A. In Canada—Powerlite Devices, Ltd., Toronto



C541

located in a semi-circle around the tap changer panel assembly ready to receive the movable contacts as operator changes bridging arrangement. On 3-phase transformers, tap changers are operated in all phases from a single external handle. Tap changer assembly is accessible for periodic inspection through man-holes in tank cover.

Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis.



Electric Lift

(31)

New mobile electric lift with 40-ft reach for use in servicing overhead power lines and street lights is designed for one-man operation. Lift is powered independently of truck engine by gasoline-driven generator set that actuates three electric motors, one to raise and lower boom, another to telescope it, the third to rotate it. Dual controls in rotating base and elevating work platform make one-man operation possible. Unit may be mounted on any dual-wheel truck of one ton capacity or more, requiring only four bolts for mounting. Patented directional control moves rig in direction of its movement, lifting boom when lifted, lowering it when pressed down, etc. Lift is also built with 30-ft and 60-ft boom.

Telsta Corp., Sunnyvale, Calif.

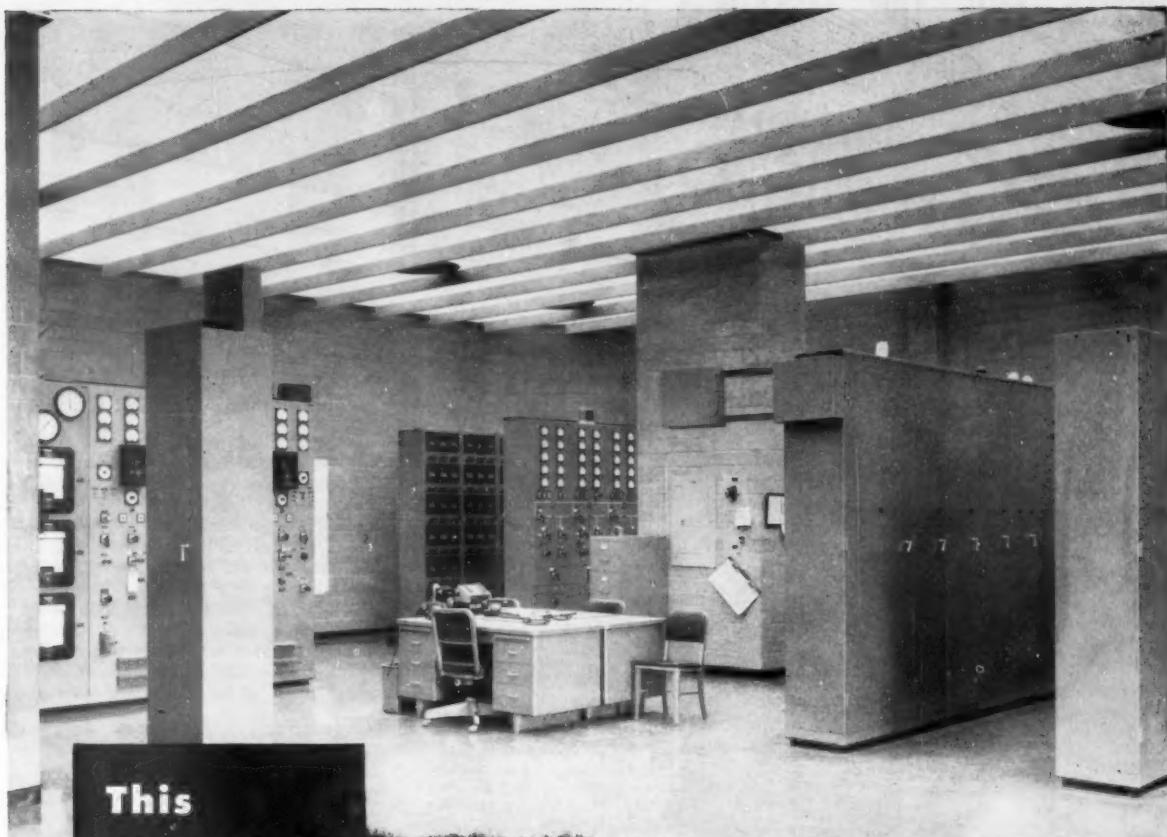
Controller

(32)

The new "400" series capacitol is an electronic controller. Available in many control forms, this completely self-contained, direct deflection, indicating controller is adaptable to a multitude of process applications. It can also be used for such applications as indicating and controlling voltages, current, speed and similar variables in process industries. It operates on the electronic control principle. A two-compartment aluminum case, designed for either surface or flush mounting, houses the components. The upper section contains a plug-in type measuring system, the lower a plug-in control chassis. Both black molded plastic cover sections are gasketed for protection against dust and moisture. Bulletin F 6314 and Educational Bulletin No. 9 are available.

Wheelco Instruments Division, Barber-Colman Co., Rockford, Ill.

A Control Room with Everything Under Control



This
Wakefield
Ceiling
provides



LIGHT
CONTROL



SOUND
CONTROL



AIR
CONTROL

Control Room of the Justin R. Whiting Plant, Erie, Michigan, newest plant in the Consumers Power Company system and considered to be among the ten most efficient in America.

It is not hard to see why a Wakefield Ceiling was chosen for this control room, which contains the vital plant controls as well as the controls for the outdoor switching equipment. In the first place, the low brightness illumination (60 footcandles maintained) is evenly distributed, without glare or shadows, creating a total luminous environment for accurate reading of the dials.

In the second place, noise is effectively reduced by acoustical baffles filled with fiber glass. And in the third place, air is diffused into the room through air diffusers integrated with the ceiling. (Another method is to diffuse air through the spaces between the baffles and the corrugated Plexiglas panels.)

More and more the trend is toward a multi-functional ceiling unit like the Wakefield Ceiling. For information that will help you plan complete ceiling installations, write to The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada: Wakefield Lighting Limited, London, Ontario.

Wakefield Over-ALL Lighting



WAKEFIELD GEOMETRICS



THE CAVALIER



THE GRENAIDER



THE PACEMAKER



THE COMMODORE



THE STAR

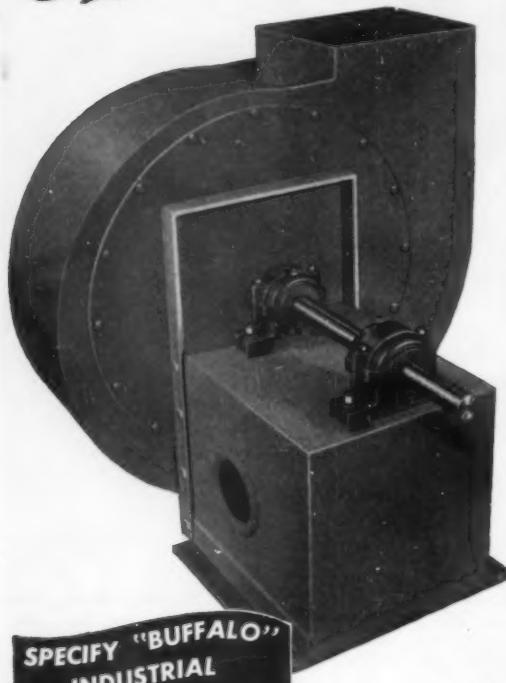


THE WAKEFIELD CEILING



Here's Why the USERS
appreciate

"Buffalo" INDUSTRIAL EXHAUSTERS



SPECIFY "BUFFALO"
INDUSTRIAL
EXHAUSTERS

EFFICIENCY

Smooth interior surfaces with no rivet heads to cause friction, mean high efficiency air or materials exhausting with "Buffalo" Industrial Exhausters. This, plus easy maintenance, means lower operating cost.

WRITE TODAY FOR
BULLETIN 3567

Right, Type "AW"
Air Wheel

Far Right, Type "MW"
Material Wheel



BUFFALO FORGE COMPANY

520 Broadway

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

Panel Breezo Fans
Breez-Air Attic Fans

• Belted Vent Sets • Belt-Air Fans
"L" Breezo Fans • "NV" Breezo Fans



Interchangeable Hubs (33)

New interchangeable hubs for rain-tight equipment, enabling distributors to have more stock flexibility without having a high inventory on each item. The rain-tight NEMA 3 enclosures, with 200-amp size capacities include safety switches, unit breakers and service control equipment. They have a round opening in the top end wall which is covered by a blank plate with a gasket. The blank plate is fastened in place with bolts and can be replaced in the field with any one of interchangeable type hubs, in sizes $\frac{3}{4}$ -in. to 2-in.

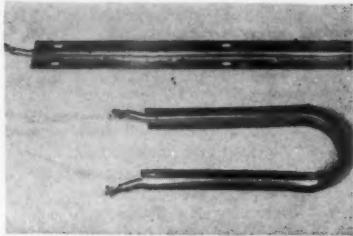
Cutler-Hammer, Inc., 228 North 12th St., Milwaukee 1, Wis.



Fittings (34)

A new line of circuit breakers and motor-starting switches for hazardous locations. They are designed for Class I, groups C and D (NEMA Type VII); Class II, groups E, F, and G and Class III (NEMA Type IX and V). With ferrous alloy bodies and aluminum alloy covers, these Pylets are available in single or two-gang types with dead-end or through-feed hub arrangement, $\frac{1}{2}$ -in., $\frac{3}{4}$ -in. and 1-in. sizes. Ratings: circuit breakers up to 30-amp, 120 volts ac. Motor starters up to 1 hp. The manual motor-starting switches are available with or without overload protection and interchangeable heater units.

Pyle-National Company, 1344 N. Kostner Ave., Chicago 51, Ill.

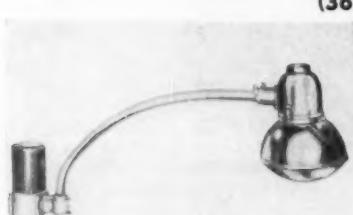


Heater

(35)

A new vane-type Calrod heater for air and surface heating is designed for a multitude of applications, including pipe, platen, valve and pump, process machinery, compound tanks, and machine surface heating. The U-shaped depression created in the vane accommodates heating element, and provides a flat surface with conveniently-located holes for easy mounting. A large radiating surface is made possible by the 1 3/4-in. wide vane, and the new heater resists mechanical shock and vibration. It is rated at 25 watts per linear inch or 14.3 watts per square inch of heater surface. Available in lengths ranging from 20 to 100 inches, 500 to 2500 watts, for either 115 or 230 volts.

General Electric Co., Schenectady 5, N. Y.



WALL BRACKET for mercury vapor luminaires. In addition to the patented hinging feature, which allows aluminum alloy bracket to be folded against building wall for easier servicing, the bracket also has a specially designed adapter which holds the mercury vapor transformer. If transformer maintenance is required, transformer can be removed without disturbing the bracket mountings. Manufactured by NEPO Manufacturing Co., 527 South Wells St., Chicago 7, Ill.

Welder

(37)

A new 300-amp, NEMA-rated, rectifier-type welder with a current range of 20 to 375 amps. It utilizes the moving primary coil design, obtaining current adjustments by separation of primary coil. Stepless current control and highly accurate amperage settings are made possible by this design. Windings are aluminum and silicone insulation is used on all coils. Cooling for coils and rectifier stacks is provided by forced-draft ventilating fans. Operating on the updraft principle the fan can be reversed by spring loaded toggle switch to blow dust from stacks. A polarity reversing switch



...thanks to

HUBBELL
Twist-Lock
TRADE-MARK
4-WIRE
ELECTRICAL
CONNECTORS

Wherever portable electrical apparatus is used, Hubbell Twist-Lock is recommended for 2, 3 or 4-wire systems.

Twist-Lock 3 and 4-wire sizes are available grounded and not grounded.



7413 Connector body



7408 Flush Motor base



4893 Seal-lite rubber cover and chain used to close face of 7408 when not in use.
(Unit not shown)

Hubbell sales engineers will gladly consult with you on special problems. Write Dept. C-1 today for help or information.

Mobile cafeteria trains, an entirely new idea in feeding large numbers of employees, are now employed at the new Torrence location of the El Segundo Division of Douglas Aircraft Company, Inc., California. The food is transported to all parts of the 214-acre plant, piping hot and ready to serve, by means of 12 three-car trains.

Hubbell Twist-Locks play an important part in this operation. When the battery-powered train pulls up to its station, the operator Twist-Locks the unit to a plant outlet to supply power for refrigerators, ovens, etc. In addition, each car is inter-connected with 4-wire Twist-Locks.

Here is another practical modern application showing the versatility and dependability of Twist-Lock, first and still the finest self-locking connector made.

Do it better . . . Do it electrically!

NATIONAL ELECTRICAL WEEK, OCT. 18-24

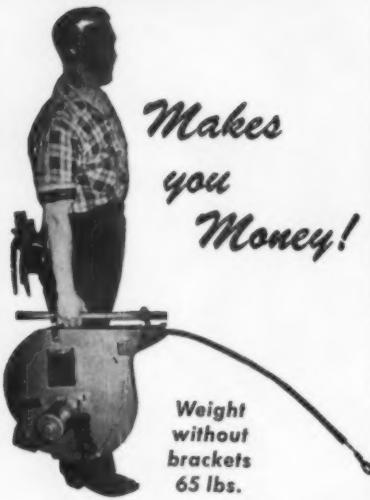
Highest Grade
HEAVY DUTY



WIRING DEVICES

HARVEY HUBBELL, INC.
BRIDGEPORT, CONNECTICUT

THE ONLY COMPLETE
**WIRE-PULLING
POWER TOOL**



**ONLY ONE SETUP
IS NEEDED!**

PUSHES 45 Ft. of fish tape per min.
PUSHES around five 90° bends.
STOPS automatically if obstructed.
PUSHES 175 Ft. of .060" x 1/4" usable highest quality tape.
MAY BE USED in any position.
INDICATOR shows how many feet of tape is pushed into conduit.
★ ★ ★
PULLS 17 Ft. per minute, full load.
PULLS 1200 Lbs. (equals pull of 8 men).
PULLS wire in 3/4" to 2" conduit.
OPERATES on 115 Volt AC or DC Current.
RUGGED, Heavy Duty Construction.

★ ★ ★

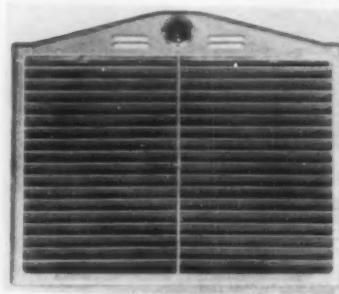
SAFE! The fish tape is always in the conduit or in the tool . . . never free to come in contact with moving machinery, bus bars, live wires, etc.

AVAILABLE THRU YOUR NEAREST
General Electric Supply Co.
Graybar Electric Co.
Westinghouse Electric Supply Co.

The **BARTH**
CORPORATION
13652 BROOK PARK RD., CLEVELAND 29, O.

is standard equipment and access for maintenance is simplified due to the unit's removable side covers. Designated 6WR30B, the welder is available for 220/440 or 550 volts operation.

General Electric Co., Schenectady 5, N. Y.



Wall Heater (38)

A new radiant electric wall heater with a thermostat and pilot light forming an integral part of the unit. There are two models, designed for surface mounting rated at 1250 and 750 watts respectively. Either may be had for operation on 230 or 115 volts ac. Heater has a thermostat containing a pilot light and is completely wired. Thermostat is a double pole, single throw temperature controller which automatically cuts off all current to heater whenever room temperature reaches thermostat setting.

ThermoRay Corporation, 141 East 44th St., New York 17, N. Y.



Instrument (39)

The Brunt ground detector and alarm is a sentinel to warn of accidental grounds as soon as they occur on power lines. It is enclosed in a gray crackle finished steel cabinet, 16-in. by 8-in. by 8-in., weighing about 14 lbs. On the face of instrument there are 3-phase indicator lights, a red bull's-eye warning light, a fuse holder, a neon indicating light, and a reset button. When alarm is wired into power system, the 3-phase indicator lights glow with equal intensity until a ground occurs on the system. Connections to ground alarm should be made at the main distribution panel, although unit itself may be installed in any spot convenient for the maintenance department to observe.

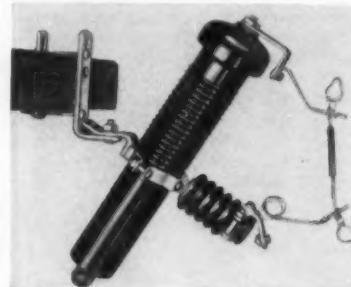
Parr Manufacturing Corp., 44 Austin St., Newark 5, N. J.

Drilling Machine

(40)

A new type mechanized Mole diamond drilling bit and portable drilling machine. Mole is designed to turn out either a production job or an individual hole at a minimum of time and expense. It uses specially designed diamond bits, and can cut through hard aggregate and steel reinforcing bars. It will drill through concrete, reinforcing bars, eye-beams, and pipe or any other hidden jobs. Mole will cut a one to six-inch diameter hole in a foot of concrete in less than two minutes. It will drill one-half to six-inch diameter holes, 18 inches deep, in one operation. Unit is mounted on wheels.

Molco Drilling Machines, Inc., 1100-20th St., N. W., Washington, D. C.



Arrester-Cutout Device (41)

A combined arrester-cutout device for economical protection of rural transformers, consists of a Type D valve arrester and an open-link STF fuse cutout. Type D valve arrester has a low impulse sparkover and low IR drop. It is a porcelain-housed unit that provides all the features of L-M's Type E valve arrester, including the isolator. Arrester-cutout device is available in three ratings—9-kv arrester with 7.8-kv cutout, 10-kv with 7.8-kv, or 15-kv with 15-kv. The combination device is angle mounted to facilitate re-fusing the cutout.

Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

Thermostat

(42)

A new low cost thermostat for electric heating, including radiant panels, wall heaters and other types. Thermostat is actuated by metal bellows, which responds quickly to temperature changes. Designed for individual room temperature control, thermostat maintains temperatures between 64° F and 80° F, with a maximum operating differential of 2° F. Adjustments for desired temperature are made with a convenient dial on face of thermostat. Unit has a switch rating of 20 amps (non-inductive load) at 125 or 250 volts ac, 3/4 hp at 115 volts ac, 1 1/2-hp at 230 volts ac. It is approved by Underwriters' Laboratories. Control is contained in a plastic case that extends 1 1/4-in. out from wall. Unit mounts directly on standard 2-in. by 3-in. switch box with two screws.

Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Box 400, Knoxville, Tenn.

here's why GrateLite* is great!

eye comfort you can measure
300 F.C. with only
1.11 C.P./Sq. In. Brightness



and here are the figures to prove it...

Foot-Candles, Efficiencies, Brightness Readings

In our own showrooms we've installed a 15' x 16' GrateLite Ceiling. By switching on various lamp arrangements we can deliver from 28 to 300 foot-candles 7' 9" below the GrateLites. Measurements at right give GrateLite efficiency figures and brightness readings at 30° and 45° below the ceiling.

THESE FIGURES PROVE GRATELITE in a class by itself for modern high intensities, safely within comfort ranges plus a high degree of diffusion.

AREA: 15' x 16' (240 Sq. Ft.)

GRATELITES: Suspended 18" below ceiling

FT.-CANDLES: Taken 7' 9" below GrateLite

BRIGHTNESS READINGS: Taken with

"Spectra" Electronic Meter

LUMINAIRES: Guth M-5385/TO

ROOM COLORS: 3 walls—light green—
66% R. F. Floor—15% R. F.

No.	No. of 8" Lamps S.M.A. Watts	Total Lamp Watts	Foot-Candles		Eff. %	Efficiency, 30° Below Ceiling		Efficiency, 45° Below Ceiling	
			With GrateLite	With Other		30°	45°	30°	45°
1	8 @ 200	1600	28	25	100	0.71	0.71	1.15	1.15
2	16 @ 200	3200	56	50	100	0.72	0.72	1.21	1.21
3	20 @ 200	4000	68	60	100	0.73	0.73	1.21	1.21
4	20 @ 400	8000	128	110	100	0.73	0.73	1.21	1.21
5	16 @ 200 24 @ 400	6400	100	88	100	0.73	0.73	1.21	1.21
6	10 @ 200 24 @ 400	5600	100	88	100	0.74	0.74	1.22	1.22
7	20 @ 200 24 @ 400	8000	200	180	100	0.77	0.76	1.27	1.27
8	40 @ 400	16000	200	180	100	0.74	0.74	1.22	1.22
9	16 @ 200 40 @ 400	6400	200	180	100	0.71	0.71	1.15	1.15
10	10 @ 200 40 @ 400	5600	200	180	100	0.71	0.71	1.15	1.15
11	24 @ 200 40 @ 400	9600	200	180	100	0.71	0.71	1.15	1.15

*F. L.—Foot Luminance **F. C.—Foot-Candles

© 1954 GUTH CO. All rights reserved. Trademarks registered.

It's all in the sight-saving cubes—and only GrateLite has them!

Guth

Send for free booklet
"The GrateLite Story"
Also "Gloss Factors" and
"Visual Comfort Indexes".

EDWIN F. GUTH CO. • ST. LOUIS 3, MO.

Leaders in Lighting Since 1902

PIERCE QUALITY FUSES

*build your
reputation*
•
*provide better
protection*



Also a complete
line of quality
non-renewable
fuses.

*WRITE TODAY for
this helpful bulletin
on lower fuse costs.
Start NOW to save
and profit through Pierce
protection!*



PIERCE RENEWABLE FUSES, INC.

LEICESTER

NEW YORK

FHP Gear-Motors

(43)

A new line of fractional-horsepower gear-motors. Motors are reconnectable externally to reverse direction of shaft rotation. Large bearings are locked to carry motor shaft thrust in either direction. Helical planet gears on concentric-shaft motor mesh with an integral ring gear, absorbing shock loads. A solidly-fixed worm gear on right-angle shaft motor assumes full rated output with no uneven speeds. Both motors are designed for use on such applications as machine tools, pumps, printing equipment, conveyors, strip feeders, material handling equipment, commercial laundry equipment, and advertising display devices. Concentric-shaft motor is available in ratings of $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{2}$ and $\frac{3}{4}$ hp, from 14.5 to 520 rpm, 115/230 volts single-phase and 220/440 volts 3-phase. Right-angle shaft gear motor is available in ratings of $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{2}$ and $\frac{3}{4}$ hp, from 24 to 148 rpm, 115/230 volts single-phase and 220/440 volts 3-phase.

General Electric Co., Schenectady 5, N. Y.



10% to 40% Cooler Operation

... assured by Pierce Screen Vented construction. Gases and heat are allowed free escape.

No unnecessary blows during safe overloads

... thanks both to famous Pierce balanced lag link construction and unique Pierce screened venting.

No danger of afterblow

... because dangerous gases and heat cannot build up in the case. Pierce cases last 6 to 8 times longer!

Product Briefs

(44) MiniTec, Los Angeles, Calif., has developed a chemical-type **thermal switch** marketed under the trade name MiniTherm. . . . (45) A re-designed portable **winch-hoist** has been announced by the Lug-All Company, Wynnewood, Pa. . . . (46) Hopkins Engineering Co., Pasadena, Calif., has developed a new **Hy-Therm** subminiature high temperature **capacitor**.

(47) Rodale Manufacturing Co., Inc., Emmaus, Pa., has announced that a built-in wing-type wrench has been incorporated into the design of the pin type **weatherproof socket**. . . . (48) Venus Products Co., Chicago, Ill., has introduced a new **instrument**, called the **Phasometer**.

(49) Slaughter Company, Piqua, Ohio, has introduced a new high-voltage insulation tester with buzzer signal on breakdowns. . . . (50) A new type **wire stripper**, cutter, crimper and soldering tweezer, known as the "Wonder Wire Worker", has been developed by Lind & Company, Inc., Mineola, L. I., N. Y.

(51) Joseph Pollak Corporation, Boston, Mass., has announced a newly designed line of series 100 and 300 dc **solennoids**. . . . (52) A new motor starting **relay**, 3ARR1, designed to start single-phase capacitor-start, and capacitor-start capacitor-run fractional-or integral-horsepower motors, has been announced by General Electric Co., Schenectady, N. Y. . . . (53) Improved hand **wire stripper** for general work and production jobs has been announced by Crown Industrial Products Co., Woodstock, Ill.

(54) Plug in type enclosed air **circuit breakers** for general commercial

and industrial applications are now available having continuous ratings of 1600 amps and less. Manufacturer is Roller-Smith Corp., Bethlehem, Pa. . . . (55) Control Systems, Inc., Brooklyn, N. Y., have developed Series 250 **voltage boosters** for air conditioners, industrial refrigeration machines. . . . (56) A new electrical **cord** for use with power saws, drills, grinders, buffers has been announced by United States Rubber Co., New York, N. Y.

(57) Electric Controller & Manufacturing Co., Cleveland, Ohio, has announced a 50,000 kva interrupting capacity air break **motor starter**. . . . (58) A new line of stationary **batteries** specifically designed for use in switchgear, control, and auxiliary power applications has been developed by C&D Batteries, Inc., Conshohocken, Pa. . . . (59) A new, heavy-duty, 2 kw ultrasonic power **generator**, the Sonogen 2,000, has been announced by the Branson Ultrasonic Company, Stamford, Conn.

(60) A high dielectric, abrasion resistant **insulating compound** for tools and equipment has been developed by the Insl-X Sales Co., Ardmore, Pa. . . . (61) Miller Electric Co., Pawtucket, R. I., has announced plastic **cord sets**. . . . (62) A new replacement-type **ignition transformer**, designed to fit almost any type of domestic oil burner, has been announced by General Electric Co., Schenectady, N. Y.

(63) Machinery Electrification, Northboro, Mass., has developed the MEK-2110 electronic time delay **relay** designed for use wherever an adjustable time delay is required. . . . (64) A magnetic amplifier **voltage regulator**, known as Recostat, for exciter control application has been developed by the Regulator Equipment Corp., Paterson, N. J. . . . (65) American Truck Equipment Co., Portland, Ore., has announced two new **hydraulic derricks**, Models HF-19 and HT-25, with a 100° arc power-operated range.

(66) A concrete insert has been designed by the Kindorf Division of Steel City Electric Co., Pittsburgh, Pa. . . . (67) Industrial Products Co., Philadelphia, Pa., has announced a new **lockout device** for electric switch and fuse boxes. . . . (68) An 8-ft post lantern made of thermoplastic material has been developed by Plymouth Industrial Products, Inc., Plymouth, Wis.

(69) A new automatic **timer** and cycle control has been introduced by Johnson Fare Box Company, Chicago, Ill. . . . (70) A new electronic **relay** for use in remote control applications as well as temperature control has been developed by Deltron, Inc., Philadelphia, Pa. . . . (71) Resistance Products Company, Harrisburg, Pa., has announced new Type L **resistors**, designed to perform in extremes of humidity, altitudes and corrosive influences.

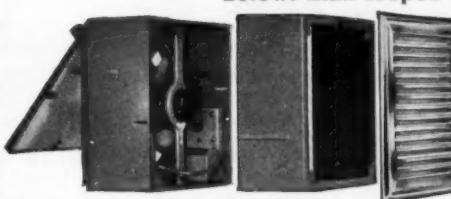


Your Assurance of Better quality, Bigger profits

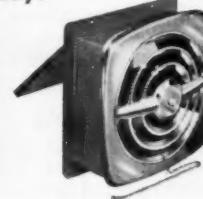
Broan MOTORDOR KITCHEN FANS AND ELECTRIC FAN-TYPE HEATERS

• Today, more and more of the nation's leading Electrical Contractors are standardizing on Broan Kitchen Fans and Bathroom Heaters. The Broan line is your assurance of not only better quality and bigger profits, but also greater ease of installation, unrivaled performance, PLUS tested merchandising support and local co-operative promotion.

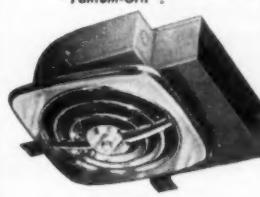
A few Broan Units are pictured below. Mail coupon today.



No. 11 MOTORDOR 10" Wall Fan, with Insulated and Motor Operated Outer Door, Telescoping Sleeve, and "Fantom-Grill".



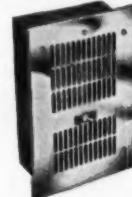
8" Chain-Control Fan No. 850 for small kitchens and bathrooms.



8" Ceiling Fan No. 860 . . . adaptable to big variety of installations.



No. 451 Ceiling or Wall Fan (10") with back draft damper and stainless steel grill.



No. S-12 Electric Fan-type Bathroom Heater . . . 1200 watts.



No. U-15 Electric Fan-Type Bathroom Heater . . . 1300 watts.

**BROAN
MFG. CO.
INC.**

1677 N. Water St.
Milwaukee 2,
Wisconsin

BROAN Mfg., Co., Inc.
1677 N. Water St., Milwaukee 2, Wis.
Please send me a FREE copy of "Extra Profits on Every Job."

Name

Address

City Zone State

Catalogs, Bulletins and Engineering Data

(72) ELECTRONIC CONTROLS for heating and ventilating systems are explained in principle in booklet F 6437, 24 pages. Barber-Colman Co.

(73) DYNAMIC BALANCING MACHINE available in three models having 10-, 500- or 4000-lb capacities. 6-page booklet describes assembly and operation of the unit. Insulation and Wires Inc.

(74) ELECTRIC HAMMERS, their applications and relative efficiency as compared to hand tools are covered in this illustrated 20-page booklet. Black & Decker Mfg. Co.

(75) DISTRIBUTION TRANSFORMERS. 24-page booklet describes each of eight G-E design features giving the details of each and the results which are obtained. GEA-6070. General Electric Co.

(76) CONNECTORS for service and distribution installations. Compression fittings are crimped by a single universal tool. Both copper and aluminum units are listed. Thomas & Betts Co.

(77) GROUND RODS and ground clamps. Condensed 4-page catalog gives prices of complete line of copper-bonded rods and fittings. Jasper Blackburn Corp.

(78) VOLTAGE BOOSTERS designed for air conditioners, refrigerating equipment and industrial machines come in two styles—fixed output and automatic controller. Bulletin 36 lists ratings and prices of 25 models in three voltage ranges up to 5.0 kva output. Control Systems Inc.

(79) FANS AND FAN PARTS. Catalog 254 combines 34 pages of illustrative and descriptive material covering fans and replacement parts grouped according to manufacturers' brand names. Visual identification simplifies selection of parts listed. Complete-Reading Electric Co., Inc.

(80) INSULATING MATERIALS. Catalog 16 gives 32 pages of descriptive and illustrated text covering all standard electrical insulating materials used in motor repair shops and maintenance departments. Complete-Reading Electric Co., Inc.

(81) RECESSED INCANDESCENT UNITS feature Holophane prismatic glass reflectors and lenses. "EZ Relamp" and "Gravity Hinge" design permits relamping from the floor level with a lamp changer. 18-page catalog gives prices, dimensions and performance data. Marvin Mfg. Co.

(82) LUGS AND CONNECTORS. Illustrated 72-page catalog gives complete dimensional data and prices for all styles and sizes, including several recent additions to the line. Graphic index simplifies selection. Ilasco Copper & Tube Products, Inc.

(83) HANGING DEVICES for conduit and cable, single or multiple runs. Out-of-the-ordinary clamps and straps detailed in this 60-page catalog will solve many special mounting problems. 201-G. Thomas Associates.

(84) MI HEATING CABLE applies the principles of mineral insulation to the electric heating field to obtain a long-life, moisture-resistant and flexible heat source. Available in lengths up to 230 ft. ratings to 3.4 kw. 8-page bulletin. Nelson Electric Mfg. Co.

(85) REGULATED BALLASTS for mercury vapor lamps designed for outdoor installations are covered in 4-page bulletin MV-208. Included is a comparison of the performance of this unit as compared with a similar non-regulated transformer; also mechanical and electrical data. Sola Electric Co.

(86) WIRING DEVICES, lamps and specialty products, numbering over 1400 types, are listed in this new 56-page catalog. Eagle Electric Mfg. Co.

(87) CABLE AND CONDUIT illustrated in this 24-page catalog include non-metallic and armored cables, types TW and SE wire and flexible steel conduit. Ettco Wire and Cable Corp.

(88) MOTORS of 20 different types and details of design features are illustrated in booklet 1878. U. S. Electrical Motors, Inc.

(89) CATHODIC PROTECTION reduces corrosion of underground structures by impressing a current through specially designed anodes. Catalog section S-6500 gives the reasons and the

methods of installing these systems. National Carbon Co.

(90) SERVICE EQUIPMENT from 30 to 6000 amps features bus bars and lugs formed from a single piece of copper to reduce the number of joints—a troublesome source of heat in fusible equipment. Dimensions and knockout locations are included. Federal Pacific Electric Co.

(91) REMOTE-CONTROL WIRING for residences. New 32-page manual 16-284 gives mounting and connecting instructions for all components, techniques of designing an RC low voltage layout, and ordering information. General Electric Co., Construction Materials Div.

(92) LIGHTING STANDARDS of prestressed concrete are the subject of 24-page catalog 300. Selection of proper base type is covered in detail. American Concrete Corp.

(93) INSULATION. Reinforced asbestos combined with glass cloth is available in various electrical and mechanical strengths. Silicone-saturated type H insulations are covered in Folder EL-54A; EL-49A and EL-55A describe new Class B types. Johns-Manville.

(94) FLUORESCENT FIXTURES. Condensed 44-page catalog combines illustrations, data and prices to simplify the selection process. Smithcraft Lighting Div.

(95) RESISTANCE TESTERS featuring high ranges are available in hand- or motor-operated models, single or triple voltage. 24-page bulletin 21-206 gives specifications and operating methods of two new models plus descriptions of other standard types. James G. Biddle Co.

(96) PORTABLE WINCH weighing only 8½ lbs. can handle up to 1½ tons. 4-page folder suggests applications for the "Lug-All" and includes descriptions of operating capacities and use of accessories. Lug-All Co.

(97) LUMINAIRES AND WALL URNS designed for use of glass "Permalectors". 4-page bulletin E gives complete engineering data. Pittsburgh Reflector Co.

(98) GERMICIDAL LAMP provides air sanitation equivalent to 100 fresh air changes per hour. Specification sheet gives design data for installation, prices, ratings and dimensions. Gruber Lighting.

(99) MAGNET WIRE. Revised catalog C-79-12, 84 pgs., now includes data on high temperature insulations and aluminum wire. Anaconda Wire & Cable Co.

you get SPEED and...

ECONOMY of INSTALLATION

with

- CRESCENT -

INTERLOCKED ARMOR POWER CABLE



**THREE CONDUCTOR
VARNISHED CAMBRIC INSULATED**

Crescent Interlocked Armor Cable provides a flexible metal-enclosed method of wiring for power. Speed and economy of installation are the principal advantages of these cables since they can be placed on easily hung racks or attached to building surfaces. This eliminates the fitting of raceways and cable pulling. On Secondary circuits much time required in bending and threading conduit can be eliminated. Maximum current carrying capacity is secured by the use of the varnished cambric insulation.

*For Further Information
Write for Bulletin No. 854*



CRESCE
NT
WIRE & CABLE
CRESCE
NT
INSULATED WIRE & CABLE CO.
TRENTON, NEW JERSEY



For the industrial lighting value of your lifetime

See! Examine! Compare!

THE NEW LIFETIME CFI SERIES



FULL 8-FOOT PORCELAIN REFLECTORS! An exclusive *Lifetime CFI* feature! Competitive fixtures give you two 4-foot reflectors to form an 8-foot section—twice as many pieces to handle during installation, twice as many joints to interfere with alignment of runs. Another exclusive: every square inch of reflection surface is finished in snow-white *Lifetime* porcelain enamel. Apertures die-embossed for strength and appearance.

Day-Brite announces the sensational new CFI-25 with 25% upward component and the CFI-10 with 10% upward component—both with important new features that promise a lifetime of unparalleled lighting performance.

From Day-Brite, the pioneer, came many of the early developments in up-lit industrial fixtures.

Now—from Day-Brite, the leader, comes a great new advancement in industrial lighting—the new *Lifetime CFI series*.

Today, the CFI-25 brings you all the desirable comfort benefits of 25% up-lighting *within a practical price range*.

This is a goal sought by many in the

lighting industry. A few manufacturers have actually marketed 25% uplighted fixtures. Until now, none had succeeded in keeping fixture costs within reasonable limits.

Day-Brite—and only Day-Brite—offers you advanced visual comfort for industry at an economically justified price. If you can afford *any* industrial lighting, you can now afford the lifetime benefits of the finest fixtures ever to reach the market.

See! Examine! Compare!

CFI-25 REFLECTOR SUPPORTS 358

POUNDS! Here's a rugged test for any reflector. Supported only at its extreme ends, the 8-foot CFI-25 reflector remains perfectly straight and rigid bearing the full weight of a 358-lb. man—no bend, no sag, no spread. That's because new ribbed construction reinforces lateral stability and a longitudinal "V" louver reinforces lengthwise rigidity (and also provides comfortable 30° cross-wise shielding). These super-rigid reflectors assure straight, true alignment of fixture runs.

See! Examine! Compare!





Complete details of the CFI-25 (left) are covered in Bulletin OD-626. The CFI-10 (right) is described in Bulletin OD-625. Write for either or both today! Day-Brite Lighting, Inc., 5402 Bulwer Ave., St. Louis 7, Mo. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

See! Examine! Compare!

You must see this revolutionary new industrial series yourself to appreciate the lifetime advantages it offers. Examine the CFI-25 and the CFI-10. Compare them with other industrial fixtures. Mark your calendar now to arrange a *Lifetime CFI* demonstration—and know firsthand why this new series is the industrial lighting value of your lifetime!

"DECIDELY BETTER"
DAY-BRITE.
Lighting Fixtures

MORE POWER IN SMALLER FRAMES

SAVE
SPACE

WEIGH
LESS

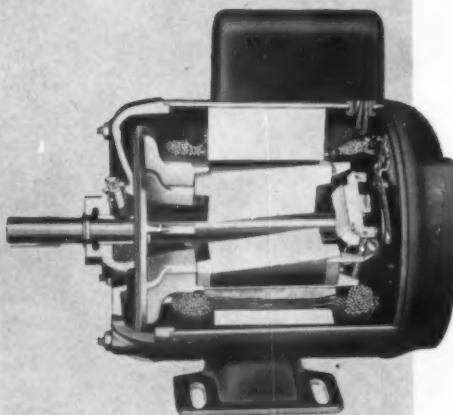


NEW *Century* Form "F" Fractional H.P. Motors

NOW AVAILABLE IN $\frac{1}{8}$ TO $\frac{3}{4}$ H.P.

Thanks to new techniques developed in the last several years, this smaller power package combines improved performance with even greater Century dependability.

Here's What New Techniques Deliver...



- 1 Better magnetic characteristics for the motor because of more uniform silicon laminated steel in magnetic cores.
- 2 A high dielectric and increased abrasive resistance qualities result from improved plastic insulated wire in the coils.
- 3 Important slot space is saved by improved plastic slot insulation. Extremely tough with higher dielectric resistance.
- 4 Unusual resistance to abrasion, moisture and heat is provided by improved thermal setting plastic varnish insulation on windings.
- 5 Squirrel cage rotors are more uniform because of improved high-pressure die-cast aluminum rotors. Individually, dynamically balanced.
- 6 Increased cooling ability is provided by improved ventilation.
- 7 These new Century Motors incorporate all mechanical features proved effective in thousands of varying applications.

For full details on Century Fractional H. P. Motors—write for bulletin 1-5 Page 1. Century also offers a wide range of types and sizes in AC and DC . . . 1/8 to 400 H. P.



CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

832

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay \$5.00.

Reader's Quiz

Capacitor Start Motor

QUESTION M26—What can be done to correct starting trouble of a $\frac{1}{2}$ -hp Leland capacitor-start motor? This is a single-phase externally reversible 220-volt motor, controlled by a standard drum type reversing switch, manually operated. A motor rebuilding shop has replaced both the starting switch and the condenser, but it did not help. Since the motor still failed to start, I checked the motor for end play, loose connections and worn bearings and found nothing wrong.

What we did find was this. With the motor running or stopped the condenser holds its charge until short circuited across the terminals. Even after the motor had run, shut off and come to rest the condenser was not discharged. If the motor fails to start, all it does is hum slightly and does not seem to draw much current, as it has remained turned on without starting for as long as 30 minutes without overheating. When stopped, a slight pull in either direction will start it.—A.E.

ANSWER TO M26—The trouble described regarding the Leland $\frac{1}{2}$ -hp capacitor start motor is evidently due to an open circuit in the starting winding circuit. The open may be in the contact points or wiring of the reversible switch, or it may be in the centrifugal starting switch or the winding or connections.

Since the capacitor takes and holds a charge the capacitor is evidently in good condition. If the starting circuit is completed when the motor stops, the capacitor would discharge through the running winding. Hence, since the motor will not start and the capacitor holds a charge after the motor stops it is evident the starting circuit is opened.

Regarding the motor standing stalled across the line for 30 minutes without overheating, the motor is probably a dual voltage type and is being operated on one-half the voltage it is connected for.

Any split phase type motor stalled across an adequate line under normal running voltage will draw three to four times its normal running amperage and considerable overheating will result in less than 30 minutes. In this case the line may be too small and allow the low-heating condition as

described or it is operating on half voltage.—J.A.

ANSWER TO M26—The condenser holding its charge, with the motor running or stopped, indicates that the switch was closed to charge the condenser, and start the motor. With the condenser still charged with the motor at rest, indicates that the governor did not function to close the switch and discharge the condenser. Check governor spool for stickiness or binding on the shaft, check governor weights for proper functioning, check governor springs against new ones for any fault.

If the governor is in good operating condition, then proceed with the following: take one starting lead, check its connection for good solder job, remove insulation for all starting coil connections and check solder job, check the second starting lead for good connection, check for any loose connection on the starting switch, examine visually all starting coils for any break or damaged winding. This accomplished will give you a good solid starting circuit. Assemble motor and open condenser leads. Your test leads across the condenser leads will light, indicating the starting switch is closed and the motor will start properly.—J.S.W.

Shock from Contact with Hot Wire

QUESTION N26—Would a person who is well grounded receive a shock if he touched a hot wire of a 480-volt, 3-phase ungrounded secondary delta connected with a star 4-wire grounded neutral primary?

A party told me he received such a shock, but I can't see how. This could bring up some interesting discussion on the effects of insulating transformers.—G.R.G.

ANSWER TO N26—Shocks, under the described conditions, are quite possible and within the realm of probability. Their severity may be affected by any of the circumstances given below.

An insulation fault or instrument connection in the secondary circuit can establish a voltage to ground. The voltage from line to ground may

or may not be the same in all phases. If the fault has a resistance sufficiently low, in comparison to body resistance, a shock may be sensed.

The practice of grounding secondary systems originally sprang from faults between the primary and secondary coils of the transformers. The voltage to ground of a wye-delta system would depend upon just where the connection occurred. If it were somewhere near the line end of the primary, a high voltage would result. Fortunately, with modern standards of transformer construction, such faults are now on the "rare" side. While the probabilities are low, the possibility still exists.

Transformers have distributed capacities between windings and between windings and ground. Since the reactance is equal to $1/2\pi fC$, current flow is proportional to the frequency and capacitance, when the voltage difference is constant. How this capacitance is distributed, in relation to the terminals of the primary coil, will determine the potential of the secondary above ground, just as in the case of primary and secondary crosses.

Perhaps the most important consideration, aside from secondary insulation faults and instrument connections, is the distributed capacitance of motors and other devices connected to the secondary circuit. This tends to establish a neutral in a delta circuit. On a 480-volt circuit, the line to neutral voltage would be 278. While the capacitance would vary from machine to machine, the combined capacitance would be the sum of the individual capacitances. Again, a greater capacitance would permit a greater current.

Another factor is the skin resistance at the point of contact. Dry callouses have a relatively high resistance.

A point was raised relative to "the effects of insulating transformers." Where the added safety warrants the additional expense, such as in an operating room of a hospital, transformers may be obtained with grounded shields between the primary and secondary windings.

By this time, it may be gathered that there is a closed circuit from ground, through a motor frame, the secondary feeders, and the transformer coils. And the right conditions may establish a circulating current. Nothing is perfect. Safety lies in the best construction that economics may dictate, together with safety minded personnel.—L.E.B.



Provides Engineered Cove Lighting AT A NEW LOW PRICE*

VISIONAIRE is a unique fluorescent fixture engineered to meet the structural and mechanical problems encountered in cove lighting that cannot be solved with conventional equipment.

VISIONAIRE is, in reality, a prefabricated lighting system available in easily installed unit lengths of 24, 33 and 48 inches to present an unbroken line of light, extremely decorative in effect.

The bottom louvered opening provides efficient down-wall lighting, while the metal side reflector, which may be either luminous or opaque, provides soft, even, over-all indirect lighting without any trace of glare.

In new construction or on a remodeling project, **VISIONAIRE** with its low initial cost, easy installation and simple maintenance, will "pay its own way" in efficiency, economy and effectiveness.

* The equipment cost for a prefabricated Visionaire lighting system is, on the average, under five dollars per foot . . . a considerable saving on ordinary built-in cove lighting that provides neither the efficiency, nor the fine finished appearance of Visionaire.

FOR COMPLETE DETAILS ▶

For complete details on Visionaire, send for this informative bulletin sheet No. 521S-11. It contains construction, performance and application data that will help you put Visionaire to its most effective use. Address request to Dept. V. . . .



SILVRAY LIGHTING, INC.

RKO BLDG., RADIO CITY NEW YORK 20, N. Y.

Static Electricity on Belt Drives

QUESTION P26—I should like to know how to totally and permanently get rid of static electricity on large flat leather belt drives in a plant. These belts travel at about 800 feet per minute.—F.J.D.

ANSWER TO P26—To permanently get rid of static electricity which collects on large flat leather belts requires the use of an idler pulley which is permanently grounded directly to earth. These idler pulleys should be as wide as the belt on which they are installed and, of course, a means must be devised to support these idler pulleys unless they are supplied in supports for such an application.

If these belts with the idler pulleys are close enough, the use of a single ground rod may serve the purpose; otherwise separate ground rods would have to be installed for each unit. DO NOT GROUND THESE IDLER PULLEYS TO DRINKING WATER PIPES OR FUEL LINE PIPES as these pipes may become charged unless a ground is taken off to the ground rods.

However, if it is desired to collect the static from both sides of the flat leather belt, I would suggest the use of small rollers on both sides of the belt and both of these connected together to the ground rod. These small rollers, like the idler pulley method I have just described, must be the same width as the belts, and both should turn freely.—L.C.D.

ANSWER TO P26—The simplest method of getting rid of static electricity on large flat belt drives is to humidify the air. This method is widely practiced in paper mills. Wherever insulating material such as paper, leather or fabric is brought into close contact with solid metallic objects, such as a roll or pulley, static charges develop at the point of separation of the insulator and the metal. These charges, in dry air, are frequently of large magnitude and are annoying and dangerous. Humidifying the air by means of steam jets is a most effective remedy, where it can be applied, i.e., where the high humidity will not rust or otherwise damage the machinery.

Another method which is very effective is a high-voltage neutralizer, usually a neon-sign-type transformer, giving about 12,000 volts on the secondary, one terminal of which is connected to an insulated metal comb, the sharp points of the comb being brought close to the leather belt. This charges the surrounding air alternately positive and negative, and effec-

tively neutralizes the static charges. Radio-active materials, either radium compounds or heavy isotopes, may also be used to ionize the air near the belt surface, thus rendering the air conductive and dissipating the static charge. This method has been commercialized by the U. S. Radium Corporation of Pittsburgh, Pa.

With all the above methods, both the stationary and moving parts of the machine must be well grounded.—S.O.H.

Formula for Determining Hp

QUESTION Q26—Can someone list a good formula for determining what hp a motor frame is good for by using core diameter, core length, and iron behind slots, etc.?—A.J.D.

ANSWER TO Q26—The most satisfactory answer I can give is to consult the NEMA Motor and Generator Standard or the National Board of Fire Underwriters for this information.

There are available standardized dimensions and motor ratings with assigned frame numbers. However the following formulas may aid you in obtaining a solution.

The output in kva of a machine using the same voltage in each case is proportional to the net iron in the frame length.

L_n = net length of iron in the core

L_g = gross length of iron in the core

L_e = axial length of the armature core

m = number of vent ducts in the center of the core

v = width of each vent duct

Therefore:

KVA is proportional to L_n

$L_n = 0.9 L_g$

$L_g = L_e - mv$

—J.B.K.

Vibrator Type Inverter

QUESTION R26—I installed a vibrator type inverter recently and noticed in the instructions that it was not suitable for very low power factor loads. Would this work o.k. if the load volt-amperes were kept within the 100% power factor wattage rating? —P.S.

ANSWER TO R26—Vibrator type inverters do not always stick to the same frequency. This can affect the speed of motors, the current drawn by other devices, the filtering effect of capacitors, etc. Manufacturers can

Lightweight Vise that's also a Work Bench...it's

RIDGID

Tristand



Tray pushes up easily to fold Tristand, pushes down easily to set up. Holds stand rigid.



Folds up for easy carrying to job and it's extra lightweight.

The Ridge Tool Company • Elyria, Ohio, U.S.A.



INSTALLING A P.A. SYSTEM?

an intercom?

a factory sound job?

WANT QUALITY WIRE?

complete line?
24-hour shipment?

special constructions?
100 or 1 million feet?

BUY ALPHA!

FREE!

Write now for your
28-page Alpha Electrical
Contractor Catalog EC-10. It's
your guide to ALL
Audio Wire and Cable.



First in Quality Wire for over 30 years

ALPHA WIRE CORP.

430 BROADWAY, NEW YORK 13, N. Y.

supply a type for your purpose.—H.S.

ANSWER TO R26—The manufacturer has established limits to give the most satisfactory service of his device.

Contacts of the vibrator will deteriorate more rapidly on inductive loads. Such loads tend to impede any change in current, thereby causing excessive sparking upon interruption.

Changes in load power factor will upset the balance of the filter circuits, resulting in a departure from the design output voltage.

We have before us a circuit diagram and a series of test voltages on a 6/110 volt, 75 watt inverter we were placing in an automobile for operating a wire recorder. The voltage regulator has four positions. Loads consisted of various size lamp bulbs as well as the recorder and a small radio.

At fixed positions of the regulator, voltage dropped at increased loads and rose with decreased power factor.—L.E.B.

**Can you ANSWER
these QUESTIONS?**

QUESTION B27—When grounding a 2500 kva, 4160-volt Y connected system, is it best to ground it through a resistor, a reactor, or ground it solidly? And why?—M.D.

QUESTION C27—In our electric motor repairing, we find that many times it is necessary to extract bad Allen screws that are of hardened steel which cannot be drilled with ordinary high speed twist drills. Can someone suggest a method of extracting these screws?—A.J.D.

QUESTION D27—What happens to the stator current in a polyphase squirrel cage induction motor if the motor is driven at synchronous speed by an overhauling load? Can it be driven faster than synchronous speed?—R.E.B.

QUESTION E27—I have used "Standco" vibrating reed tachometers to measure revolutions per minute on motors and totally enclosed rotating equipment with much success. I would like to know if men in the plant or field have found other uses for these instruments for tasks relating to vibration measurement or vibration study.—H.J.F.

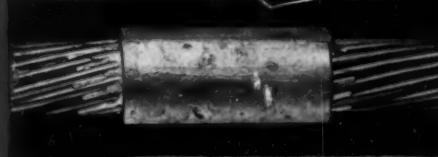
**PLEASE SEND IN
YOUR ANSWER BY NOVEMBER 15**

When Ignited
THESE TWO COMBINE
TO MAKE

The world's finest

**ELECTRICAL
CONNECTION
CADWELD**

Completed CADWELD
connection




The Current Trend
IS
CADWELD

ERICO PRODUCTS, INC.
2070 E. 61st PLACE CLEVELAND 3, OHIO

ERICO PRODUCTS, INC.

2070 E. 61st PLACE

CLEVELAND 3, OHIO

- Send Descriptive Literature on CADWELD Electrical Connections
 Have Representative Call

NAME _____ POSITION _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Questions on the Code

Answered by

B. A. McDONALD, New York Board of Fire Underwriters, Rochester, N. Y.

GLENN ROWELL, Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.

B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.

Panelboard Overcurrent Protection

Q. The following sketch shows an arrangement of a feeder supplying two panelboards. I believe all information therein is self-explanatory. I would like to know as to whether Section 3883 of the National Electrical Code requires that main circuit breakers be provided in each panel? —G.K.

A. It will be assumed that both panel A and B are "lighting and appliance branch circuit" panelboards as defined in Section 3881.

Paragraph "a" of 3883 excepts service type of panelboards, but this exception does not apply since feeder breakers, which may be part of supplementary service equipment, are installed.

The conductors feeding the two panelboards are protected at 400 amps. Section 3883a specifically states that where the overcurrent protection of the panelboard supply conductors exceeds 200 amps, the panelboard shall have overcurrent devices on its supply side, rated at the panelboard rating or less. The panelboards shown are rated at 400 amps so that the 400-amp feeder breaker will provide proper overcurrent protection and no additional protection need be provided at each individual panelboard, as far as the requirements of this paragraph "a" are concerned.

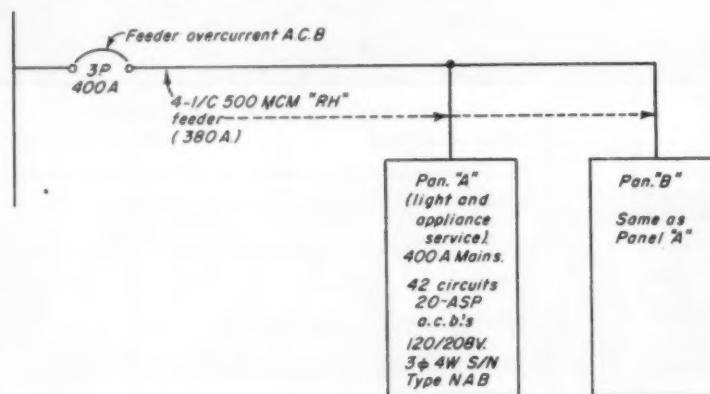
Paragraph "b" of this same section stipulates, however, that all panelboards equipped with snap switches

rated at 30 amps or less shall have main overcurrent protection not to exceed 200 amps. The circuit breaker switches are generally tested to clear 5000 amps short-circuit current. The general run of snap switches (usually installed in conjunction with approved fuses which can also clear such short circuit currents) cannot be operated to clear these high short circuit currents. So for the specific problem shown these panelboards would NOT require additional main circuit breakers in each panelboard.—B.Z.S.

Oil Burner Wiring

Q. Does the use of non-metallic type of cable (Romex for example) constitute a Code violation when used for wiring circuits to oil-burner type furnaces in homes? Please explain what parts of the Code, if any, apply to oil burners and other controls. —F.H.B. and D.M.H.

A. While the Code does not specifically prohibit the use of non-metallic sheathed cable for use in the wiring of oil burner circuits in residential occupancies, there is, in my opinion, a part of such circuits where it would be difficult to satisfy the Code requirements of Article 336 and 300 which apply to this wiring method. I have in mind that part of the circuit which comes from the ceiling level and extends down to the motor and its controls.



Section 3363 of the Code requires non-metallic sheathed cable to be properly supported within 12 inches of outlets or fittings. Section 3364, covering exposed work, requires the cable to closely follow the building finish or of running boards; or to be protected from mechanical injury by conduit, pipe, guard strips or other means. Section 3003-b requires conductors to be adequately protected from mechanical injury. In order to fully satisfy these requirements it appears to me that the part of the circuit extending from the ceiling level down along the side of the furnace is exposed to considerable mechanical injury and should be protected by the use of rigid conduit. Some authorities however do accept armored cable, but there could be a question of such use since Section 3344 requires a/c to follow the surface of the building finish except for 24-inch lengths at terminals where flexibility is necessary.

The problem of grounding the equipment as required by Section 2557 should also be considered, as well as that which concerns the exposure of the conductors to the possible heat at some parts of the furnace jackets where they are installed.

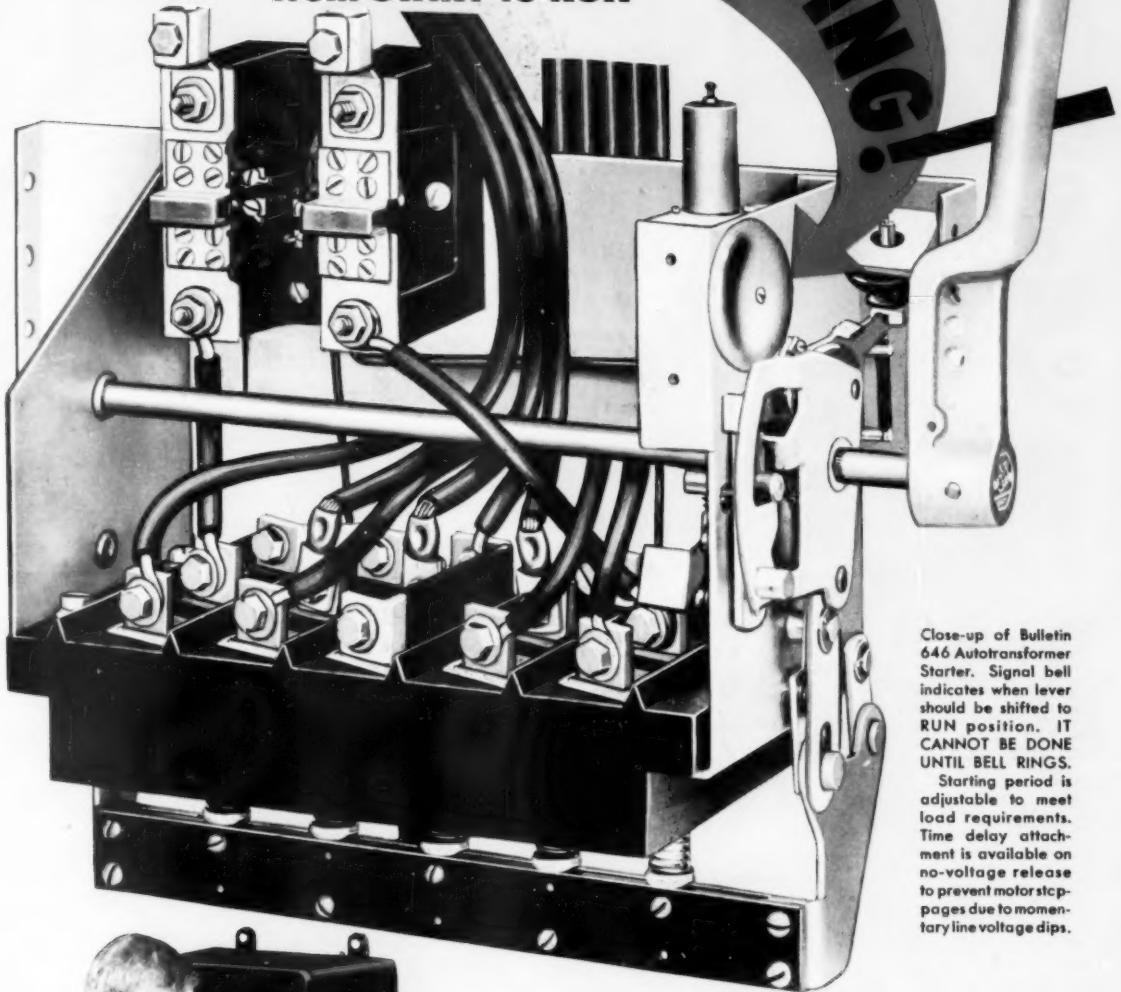
Article 725 covers remote control and signal circuits and while oil burner controls are not specifically mentioned, they usually come under the requirements of a Class 2 circuit as classified by Section 7253. The limitations of a Class 2 system are covered by Sections 7281 to 7283.

As a result of the foregoing comment, it appears to me that non-metallic sheathed cable may be used when it is adequately protected from mechanical injury and properly supported. Since it is difficult to formulate specific rules covering such protection in view of the variables involved, it is the responsibility of the inspector to determine in line with local conditions what is deemed necessary to satisfy this requirement. Perhaps his past experience indicates the need for requirements which vary with other authorities. He should be consulted on any question which involves an interpretation of mechanical injury when not specifically covered by the Code. An official interpretation on this point

WHEN THIS BELL GOES

... it's your signal to shift the lever

from START to RUN



Close-up of Bulletin 646 Autotransformer Starter. Signal bell indicates when lever should be shifted to RUN position. IT CANNOT BE DONE UNTIL BELL RINGS.

Starting period is adjustable to meet load requirements. Time delay attachment is available on no-voltage release to prevent motor stoppages due to momentary line voltage dips.



Air-break Contacts up to 75 HP, 220 V; 150 HP, 440-550 V

The outstanding feature of the Allen-Bradley Bulletin 646 Autotransformer Starter—in Sizes A, B, & C—is the use of silver alloy, air-break contacts. They do away with oil tanks and messy contact maintenance. Only the Size D starter—rated up to 250 hp, 440-550 v—requires oil-immersed contacts.

Send for Bulletin 646 giving complete details on this popular line of reduced voltage squirrel cage motor starters.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Limited, Galt, Ont.

9-54-M

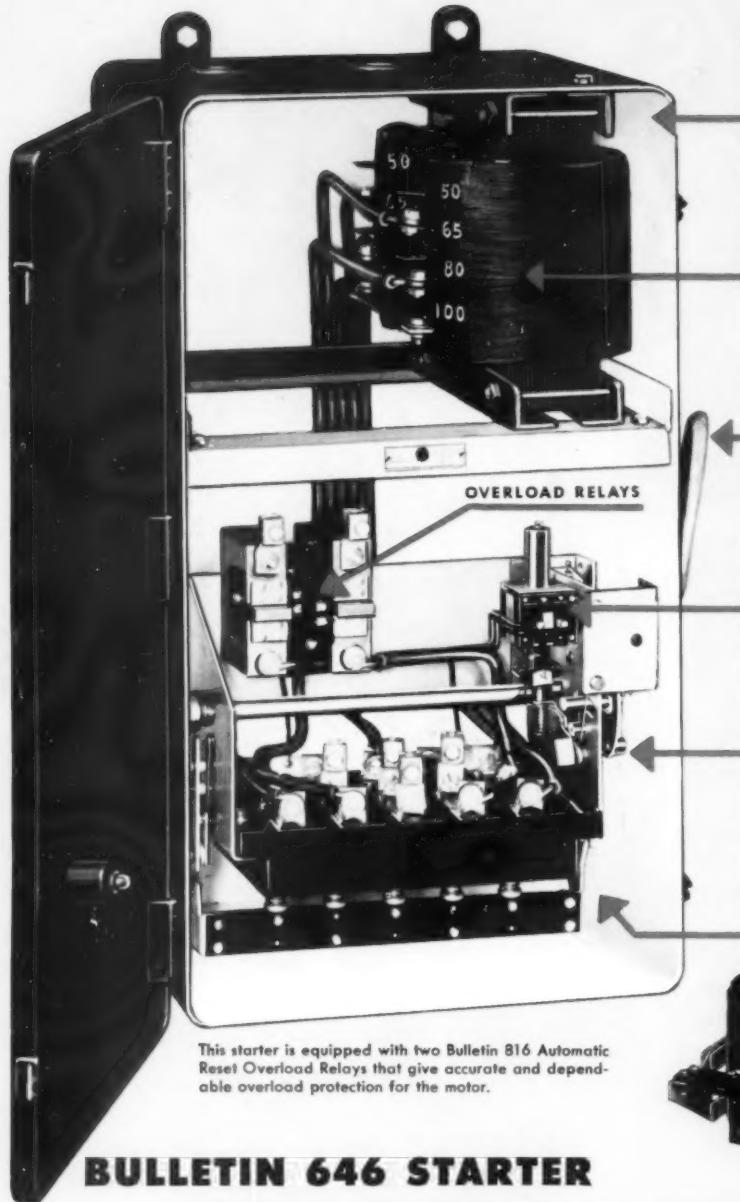


Operator listening for signal bell which indicates when to throw lever into RUN position.

ALLEN-BRADLEY

BULLETIN 646 AUTOTRANSFORMER STARTER

QUALITY



BULLETIN 646 STARTER

HAS AIR-BREAK CONTACTS up to 75 HP, 220 V; 150 HP, 440-550 V

GOOD NEWS . . . Bulletin 646 Autotransformer Starters are available with AIR-BREAK contacts in ratings up to 75 hp, 220 v; and 150 hp, 440-550 v. Only Size D starters require oil-immersed contacts for motors up to 250 hp. The oil-immersed construction can be supplied, however, in Sizes A, B, and C, but their use should be limited to the types of installations which require oil-immersed contacts.

The extraordinary advantage of air-break contacts accounts for the booming popularity of the Sizes A, B, and C starters in the Bulletin 646 line. The silver alloy contacts remain in good condition without filing, cleaning, or dressing. Send for Bulletin 646, which gives all the facts about these remarkable starters. They are the only modern starters of this type on the market.



Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

In Canada — Allen-Bradley
Canada Limited, Galt, Ont.

9-54-M

ALLEN-BRADLEY
QUALITY
BULLETIN 646 AUTOTRANSFORMER STARTER

was issued November 7, 1947. It reads as follows (the rule reads the same now as it did in 1947):

"Section 3364. Interpretation No. 300. 11/7/47

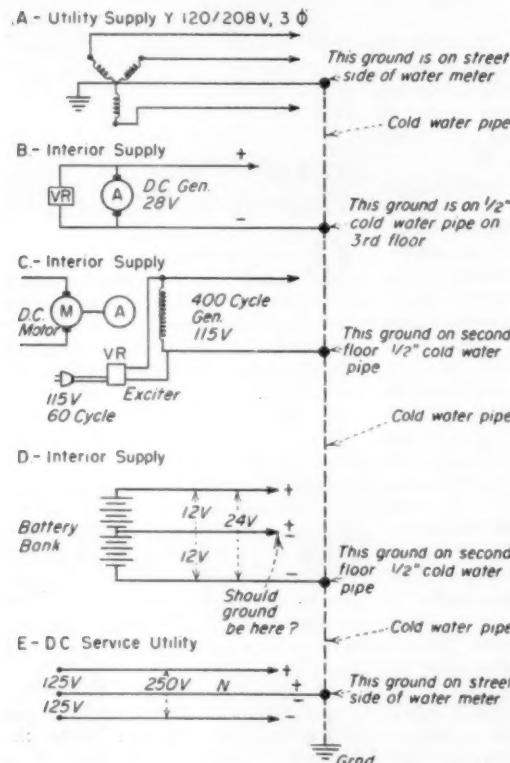
"Question: Who is to determine what protection if any, from mechanical injury is needed when applying paragraph B of Section 3364 of the 1947 edition of the National Electrical Code?

"FINDING: The authority enforcing the Code".—B.A.McD.

Grounding Systems and Circuits

Q. Is there any Code violation in the following illustration? Is it permissible to ground all the systems as indicated? Ground wire sizes are all No. 6 or larger. Must fuses be removed from all grounded conductors? I assume so, but does it apply to the low voltage systems also? This grounding as indicated in sketch has been requested by a research group as the electrostatic potentials on the various interior systems result in improper operation of electronic equipment.—P.P.G.

A. According to Section 2514 the 3-phase, 4-wire wye-connected system shown by (A) operating at 120 volts to ground, must be grounded.



According to Section 2517 and also 7210-b of the Code, the 28-volt 2-wire dc system or circuit must be grounded if conductors are run overhead between buildings or if the circuit is supplied through a transformer from an ungrounded circuit or from a grounded circuit of more than 150 volts. Sections 2517 and 7210-b are exceptions to the general provisions for 2-wire dc systems covered by Section 2512. It therefore appears that there would be no objection to the ground shown under "B" of your illustration.

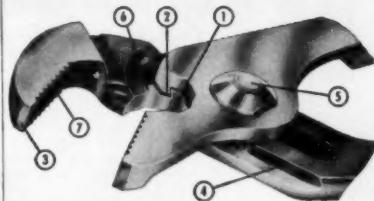
It also appears that the 400-cycle, 115-volt circuit shown by "C" should be grounded as covered by Section 2514 and the general intent expressed in Section 2511.

The 3-wire 12/24-volt battery bank shown by "D" should be grounded at the neutral point as covered by Section 2513. The exceptions covered by Sections 2517 and 7210-b, however, would apply here the same as in the case covered by "B" above.

In connection with the 3-wire 125/250-volt, dc service shown by "E" which is supplied by the electric utility, Section 2513 requires the neutral of such a system to be grounded. Section 2522 however requires that the ground connection be made at the supply station and prohibits grounding at the individual service. This provision applies only to the system ground and does not involve the requirements for grounding equipment as covered by 2532. It is also noticeable that the provisions for a common grounding conductor covered by Sections 2553-2554 and 2561 could be applied in the case of dc services.

Section 2409 of the Code prohibits the use of overcurrent devices in any permanently grounded conductor with an exception for devices which simultaneously open all conductors of the circuit; where the likelihood of reversal of polarity exists; and for motor running protection as provided in Sections 4326 and 4327. It therefore appears that the fuses now in the grounded conductor, irrespective of the voltage, should be removed.

—B.A.McD.



here's why

1. Interlocking principle prevents slipping under any load.
2. New type wide base lugs cannot shear.
3. New nose design for gripping small objects.
4. Patented design of tension edge eliminates stress concentration at channels.
5. Interlocking design minimizes stress on joint bolt.
6. Precision machined interlocking surfaces result in perfect fit, distributing pressure evenly.
7. "Rite Angle" teeth guarantee maximum bite and minimum wear.

Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line—you'll find a style and model to do any job better.



Costs and tempers go down when you use the world's handiest benders!



Here's a happy electrician! His handy, portable Blackhawk Bender permits bench-top as well as floor operation . . . makes kinkless bends, matched offsets and rigid installations easy.



HANDIEST...
because the Blackhawk "Porto-Power"™ remotely-controlled hydraulic jack operates in any position . . . on its side or upright . . . whichever way it's easiest to measure the bend.

HANDIEST...
because it's really portable. You can use it on the floor, on the bench or overhead on existing pipe runs. And — it's easy to roll or carry to the job.

HANDIEST...
because you can simultaneously pump and sight the job from any angle . . . assure better bends. Can be hand operated or motor driven.



LOW COST TOO!

Example: The S-30A kit for bending 1 to 2" rigid conduit contains powerful "Porto-Power" hydraulic jack and 9 bending attachments . . . costs only \$135.45

Price subject to change without notice

BENDERS FOR ALL WORK — For thinwall or conduit up to 4" — Blackhawk Benders pay for themselves in a hurry. Order from leading supply houses or write for catalog 50-B. Blackhawk Mfg. Co., Dept. J-20104 Milwaukee 1, Wisconsin.

BLACKHAWK

Wiring for a Small Plant

Q. I am about to replace some wiring damaged by a fire in a small plant which refines used motor oil, commonly known as crankcase drainings. This plant processes approximately 2000 gallons per day and both the filter equipment and cooking kettles are contained within a weather shelter which has approximately 50% of its exterior wall area open. The wiring which was located within this building was all ordinary with the exception of a couple of explosion-proof motors which the owner explained had been required by a previous inspector. Therefore, there is some doubt in my mind as to whether or not this entire building should be wired as required for a Class I, Division I, location. As the temperature used in the processing of this motor oil is far above its flash point, am I correct in assuming that I must use Class I, Group D equipment? —H.A.P.

A. The determination of whether or not a particular building, area or room must be wired in Class I compliance rests entirely with the authority having jurisdiction. It, therefore, would seem advisable to contact your inspection department and discuss the problem with them. Crankcase drainings taken from internal combustion engines during cold weather months will contain a small percentage of gasoline; therefore, if this process were contained within a normal building, there would be no question but that equipment located on the floor of the building or within several feet of the floor should be of the Class I, Group D type, unless that building were provided with an adequate ventilating system which would bring about at least ten air changes per hour with all discharge air being taken from the floor in such a manner that no pockets of undisturbed air would remain. On the other hand, with the building being simply a weather shelter with over 50% of the side walls open to the outside and with the floor level without pockets or depressions and being above grade level, it would be impossible for gasoline vapors to form on this floor. We need not be concerned with the lubricating oil itself regardless of the temperatures used during the refining process, as an explosive or combustible vapor air mixture cannot be formed in an area or room unless the ambient temperature of that room is at or above the flash point of the liquid involved. As the flash point of lubricating oils varies from 300 to 600 degrees, you can readily understand that

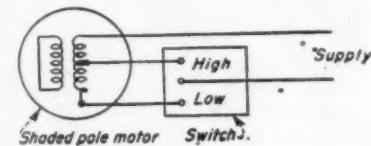
it would be impossible for a flammable mixture of the oils themselves to form outside of the refining apparatus within this room. Furthermore, I believe you will find that the oil contained within the heat treating kettles is vented to the outside through a stack extending through the roof of this building so that any volatile matters such as gasoline which may be contained will be immediately vaporized and driven from the product to the outside where it can readily dissipate. —G.R.

Shaded Pole Motor

Q. We have a 105-watt, 115-volt, 60-cycle, 1450-rpm floor ventilator motor, 4-pole shaded winding.

Kindly sketch the winding connections and the connections to the 3-pole switch for 2 speeds. —E.E.R.

A. There are many variations for this type of motor. Speed control may be made by means of tapping the main windings as shown in the sketch below; or external re-



sistors, reactors or autotransformers may be used. Your best bet would be to write the manufacturer of your particular fan for the exact information. —B.Z.S.

Circuit Wiring in Fluorescent Fixtures

Q. I have just reread the answer on page 219 of the April issue of Electrical Construction and Maintenance, which quotes official interpretation No. 287 of February 21, 1947 and also No. 297 of July 17, 1947. Also at hand is section 4144 of 1953 Code. The last large type sentence starts "Where temperatures do not exceed 60° C. Type T, etc."

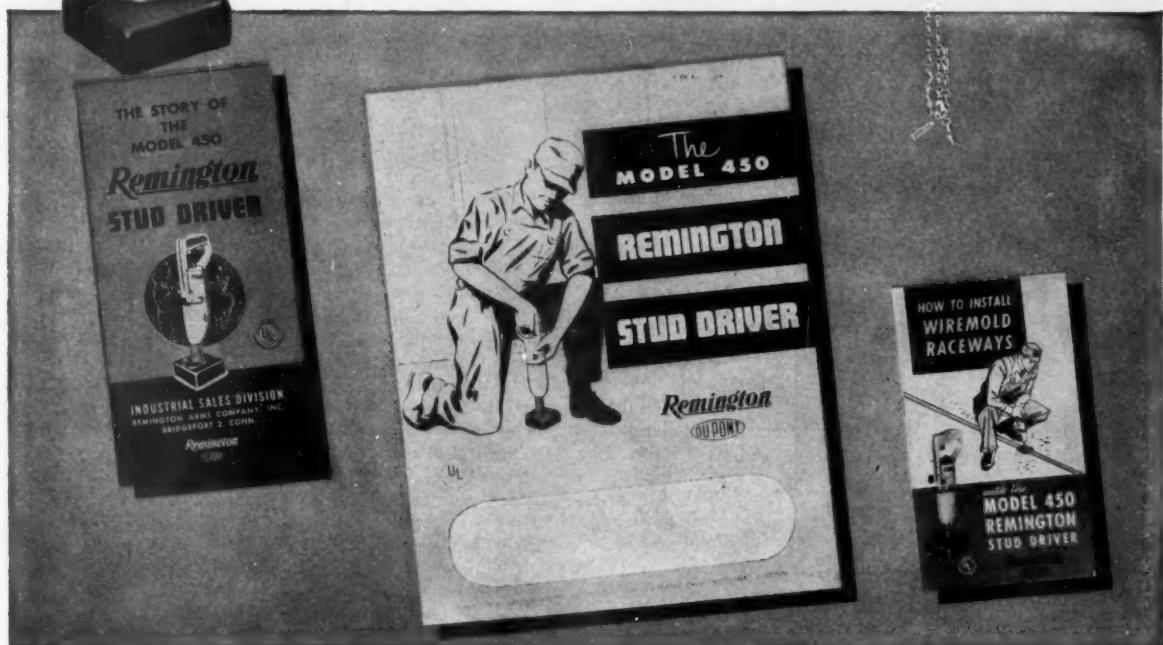
Do the temperatures present in surface mounted slimline end to end fixtures such as Benjamin's, Leader No. 296-430 or Smithcraft similar number require the use of RH wire or permit the use of R and TW wire for the circuit conductors? Ambient temperature seldom reaches 100°F through these fixtures. —C.H.A.

A. Since the Benjamin catalogue available did not cover the particular fixture in question, it is



Read how the REMINGTON STUD DRIVER cuts fastening costs!

Free booklets show where powder-actuated
tool can be profitably used



THE STORY OF THE REMINGTON STUD DRIVER. Here's an easy-to-read illustrated booklet that shows you how the tool operates and points out its important features. You'll see close-ups of the Stud Driver in use, securing structural channels, furring strips and many other fittings to steel and concrete surfaces.

THE REMINGTON STUD DRIVER. A complete catalog — it shows actual-size drawings of the Remington Studs available. Another section deals with the special guards for the tool used to fit over lathing sections, flexible framing sections, wood sills and other sections and fittings.

THE WIREMOLD SYSTEM. It's a specially prepared booklet that describes anchoring Wiremold channels with a Stud Driver. A special Remington guard is available for this application. This booklet takes you step by step through the entire Wiremold Raceway & Wireway installation system.

"If It's Remington—It's Right!"

Remington
DUPONT



Listed & Approved by Underwriters' Laboratories, Inc.

Industrial Sales Division, Dept. E.C.M.-10
Remington Arms Company, Inc., Bridgeport 2, Conn.

Please send me the booklets checked.

- The Story of the Remington Stud Driver
 The Remington Stud Driver
 How to Install Wiremold Sections

Name _____

Position _____

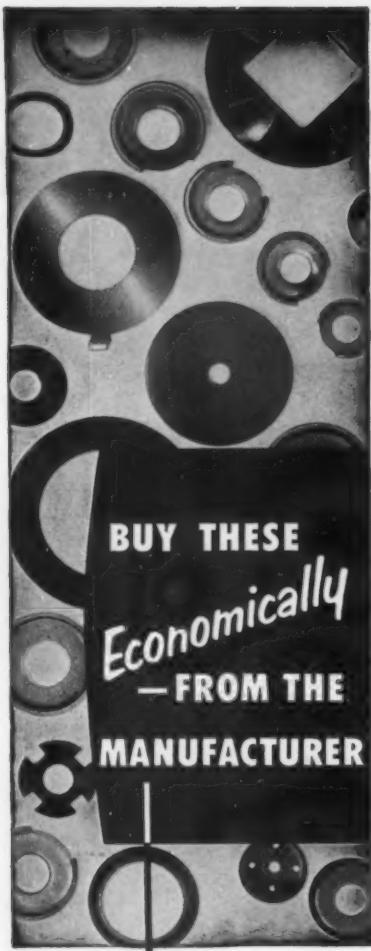
Firm _____

Address _____

City _____

State _____





When you're ordering CUP WASHERS for binding screws; FLAT WASHERS; SPRING TENSION WASHERS, spherical or form rim type, whether you want them made from spring brass, phosphor bronze, or spring steel, and tempered: save yourself money by buying from the manufacturer.

The Whitehead Catalog lists hundreds of washer sizes; cable clips; pipe, conduit, and wire clips; burrs, plugs, spacer shims, retainers, gaskets. Write for this catalog and—buy what you need from it—Economically!



**WHITEHEAD
STAMPING CO.**

1679 W. Lafayette Blvd.
Detroit 16, Michigan

difficult to make a definite commitment. Speaking in general, however, it is my experience with any of the fluorescent types of fixtures which involve the use of ballasts, capacitors or resistance units, that the design usually is such that the conductors inside the fixture enclosures might in some cases be subjected to temperatures as high as 194°F. This condition may occur in the case of a ballast under continuous operation with the starter switch short-circuited. Other conditions also are concerned with ballast operating temperature. Suitable ventilation, capacitor failure and over-voltage, all are concerned with the temperature a ballast may reach. It is therefore important in any fixture designed to carry the circuit wiring that exposure to the heat radiated by the ballast is considered.

As an example, Underwriters' Laboratories, in their 1953 Electrical Equipment List, pages 330-332, cover several surface raceways which are suitable for use with lampholders and control units for tubular fluorescent lamps mounted directly on the raceway, provided the conductors used in the raceway are suitable for operation at 75°C. This is a definite commitment backed by laboratory test and could be used to some degree in judging other fixture designs. It is also important to note the type of insulated wire used in wiring a fixture approved by U. L. If the insulation is of Type RFH-1 or CF, as covered by Section 3102 of the Code, the circuit wiring should be of similar insulation provided the conductors are exposed to the same temperature. I recall an advertisement of Benjamin covering their "Task Master" fluorescent fixture, (See January issue EC&M, 1953.) These fixtures come pre-wired, with the branch circuit wiring run through a combination spine support and lamp shield, with terminal blocks which facilitate connections between fixtures designed for end-to-end installation. The ballast is located in the end section and the conductors are exposed at this point to the ballast temperature. Since this fixture undoubtedly carries the label of U. L. and the circuit wiring is covered by the approval, it is my belief that at least type RH conductors will be used. Time has not permitted me to check this point. This, however, is a case where we would have a definite U. L. commitment on this point which might be used to some extent in judging similar designs.

Section 4144 of the Code which concerns the wiring of a fixture recognizes the use of Types R and T conductors for this purpose provided they are not subjected to temperatures in excess of 60°C (140°F). The cur-

rent carrying capacity of such conductors however would be subject to the correction factors when they operate at temperatures exceeding 30°C-86°F as covered by Table No. 1, Chapter 10, Note No. 7. As an example, a No. 14 conductor, either Type R or T operating in a temperature of 113°F, would have a current capacity of 71% x 15, which equals 10 amperes. If the same conductors were exposed to temperatures of 135°F, which is within 10° of the maximum operating temperature, they could not be used. As a result of these requirements, it is evident that a conductor may be used in an ambient temperature within 10° of the maximum permitted, but the penalties involved would make it impracticable to apply the rule. As a result I believe good practice dictates that we use conductor insulation of higher operating temperatures instead of applying correction factors.

In addition to the foregoing methods of procedure an inspector may run temperature tests under actual field conditions. Such readings however should be taken where the most heat will be generated, which usually is in the area of the ballast and capacitor. In view of the foregoing, it appears to me that the circuit conductors should be at least RH, 75°C-167°F, rating.—B.A.McD.

Emergency Lighting

Q. Does the code require emergency lighting and exit signs in a one-story school building containing eight classrooms, cafeteria and assembly hall and gymnasium? —M.O.

A. The National Electrical Code does not require emergency systems or exit lighting in any kind of a building. Instead it contains under Article 700 in Section 7001 the following statement: "The provisions of this article apply to the installation, operation and maintenance of circuits, systems and equipment intended to supply illumination and power in the event of failure of the normal supply or in the event of accident to elements of a system supplying power and illumination essential for safety to life and property where such systems or circuits are legally required by municipal, state, federal or other codes, or by any governmental agency having jurisdiction." Many governmental agencies having jurisdiction over the erection of buildings used by the public follow the rules and regulations as contained in the Building Exits Code, a publication of the National Fire

DRIVE-IT

SAVES 30% IN LIGHTING INSTALLATION COSTS!



Electricians in new Northwest factory use DRIVE-IT 320 for overhead installations. 18,000 pins were used on fixtures and leads.

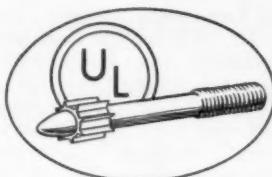


NEW EXCLUSIVE

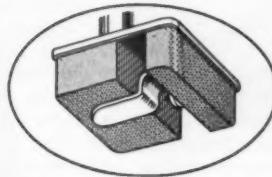


DRIVE-IT 320 WITH BREAK-OPEN ACTION

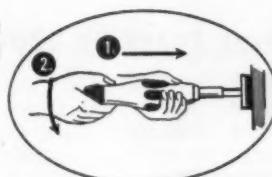
Snap open action results in the fastest operating tool on the market. Easiest method to load and eject cartridges under any condition.



Drive pins are Underwriters' Laboratories approved.



Exclusive Safety Pads developed for specific jobs such as conduit clamp, brackets, or fuse boxes.



Three-way Safety. Cannot be discharged accidentally, due to the push and turn firing sequence. This, plus the large, swivel safety pad, makes DRIVE-IT triple safe.

More fastenings per hour with this speedy way of loading and ejecting cartridges.

DRIVE-IT

the original POWDER-ACTUATED TOOL

SEND
THIS
COUPON
FOR FULL
DETAILS

POWDER POWER TOOL CORP.
Dept. I, 7526 S.W. Macadam Ave., Portland 1, Ore.

Canada: Ammo Power Tool Co., Ltd.
735 Broadway, Vancouver, B. C.

- Please send FREE catalogue and literature.
 I want a FREE demonstration of DRIVE-IT.

Name _____

Street _____

City _____ State _____

for easier, safer,
faster
testing...



the **KNOPP**
Voltage Tester
with the patented
PROD-MOUNT



has 5 Safety Features ... many uses

When you get the pace-setting Knopp Voltage Tester you say "Goodbye to risky, time-wasting fuss in testing" because of 5 main safety features: (1) exclusive Prod-mounting Socket in housing making this tester easier, faster, and safer to use, and ending time-wasting "three-handed" testing; (2) protection through dual indication of voltage by solenoid and neon lamp working independently; (3) positive scale readings; (4) signal by hum and vibration; and (5) thorough insulation throughout, even to the sharp point of each prod.

Well-built and shock-proof in a LAMINATED Bakelite housing, the Knopp Voltage Tester tells immediately and simply if circuit is open or closed; magnitude of voltage between 110 and 600; a-c or d-c, pure or rectified; 25 or 60 cycles, for testing old and new circuits, fuses, locating grounds, etc.

Some of the nation's largest utilities, after testing all brands, use Knopp Voltage Testers by the hundreds.

Get the widely-used, reliable Knopp Voltage Tester with the exclusive, time-proved Prod-Mount, and other safety features, from your dealer, or write for illustrated, free, new, descriptive Bulletin No. 425.



KNOPP
Electrical Facilities Inc.

4232 HOLDEN STREET, OAKLAND 8, CALIF.

Protection Association, and under Section 2169 of this publication you will find the following requirement: "All auditoriums, assembly halls, gymnasiums, stairways, corridors, exits and exitways shall have illumination and signs in accordance with Section 12." Therefore, if the governmental agency having supervision over safety to life and property in the area in which the school in question is being built uses this code, it, of course, will be necessary for you to provide the emergency illumination and exit signs. It is also possible that the governmental agency will have a code of their own which will also require special emergency illumination. I, therefore, would recommend that you contact the agency having jurisdiction and obtain the necessary information from them concerning this requirement.—G.R.

pump. What is your interpretation on this? What section of Code applies to this if there is a violation?—C.H.

A. Section 2403 of the Code recognizes the use of plug fuses and fuse holders on circuits having a grounded neutral and no conductor in such circuits operating at more than 150 volts to ground. According to your diagram you have a 3-wire, 110/220-volt service with the neutral conductor grounded. The greatest voltage to ground on such a system is 110 volts. It therefore appears that the plug fuses used on the 220-volt circuit feeding the pump are not in violation of the Code. The question of local requirements may enter the picture. There might, however, be a question concerning the use of non-metallic sheathed cable for the tap to the switch. Section 2434d, which covers the 25-ft. tap rule, requires such taps to be suitably protected from mechanical injury. This is a question which must be decided by the inspector in line with any particular conditions which may apply locally to this installation. —B.A.McD.

Switchgear Units

Q. Is it necessary to install an air break isolating type switch on a 4160-volt service that enters a modern, metal-enclosed switchgear?—S.J.A.

A. Your answer will be found under Section 2390 of the National Electrical Code where paragraph "a" states that the air break isolating switch shall be installed between oil switches or air or oil circuit breakers used as service switches and the supply conductor, except where such equipment is mounted on removable truck panels or metal-enclosed switchgear units which cannot be opened unless the circuit is disconnected and which if removed from the normal operating position automatically disconnect the circuit breaker or switch from all live parts. Therefore, if the metal-enclosed switchgear to which you referred is of this type, the switch head is not required.—G.R.

Motor Disconnect

Q. We would like more information concerning Section 4386, In Sight of the Controller Location, and Section 4402, Disconnecting Means. The question in mind is concerning the term "In Sight". Can a disconnect be placed in another room, or even on another floor of a building, and still comply with the Code? Is it permissible to place a lockout type switch at a point out of visible sight, and more than 50 feet, as one would have to walk, from the motor which the switch serves?—L.E.C.

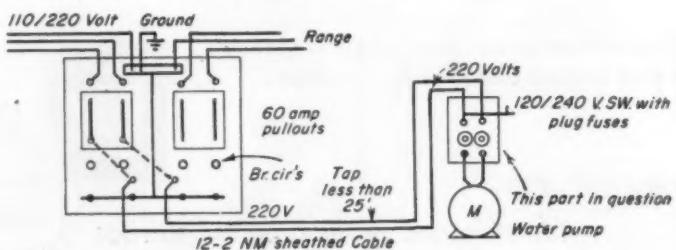
A. A motor disconnect, in general, can be installed at most any point in any specific installation. If it is "out of sight" or at "more than 50 feet distance" from the controller location (See Section 4409), then one of two things may be done.

One, the disconnect may be provided with a device which will permit locking the disconnect in "open position."

Two, a second disconnect may be

Plug Fuses On 220-Volts

Q. Will you please advise me if there are any Code violations in the following diagram. If so, what article of the Code applies to them. Inspector contends 220 volts cannot be used with plug fuses for the water



Just Screw Them On -



Like a
Nut on a Bolt!



Patented, No. 1,933,555.

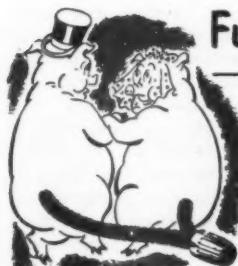
THE SOLDERLESS, TAPELESS WIRE CONNECTORS

**The Easiest Way to Make FAIL-PROOF,
FOOL-PROOF PIGTAIL SPLICES**

Twists...Threads
...Grips with
Spring Tension...
and Insulates
...ALL AT ONCE!

Only IDEAL Makes "Wire-Nut" Connectors
Look for the Name IDEAL

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS



Fully Approved!

Contractor sizes 74B and
76B are fully approved as
pressure cable connectors
for general use in all
types of branch circuit
wiring, with all common
wire combinations.



TRY
THEM
FREE!

CANADIAN DISTRIBUTOR: IRVING SMITH, LTD., MONTREAL

IDEAL INDUSTRIES, INC.

1041 Park Avenue, Sycamore, Illinois



Please send FREE SAMPLES of IDEAL "Wire-Nut" Connectors.

Name _____

Company _____

Street _____

City _____ Zone _____ State _____

BIDDLE Instrument News

MEGGER® ELECTRICAL INSULATION TESTERS

Hand—Rectifier—or Combination Operation—

Ratings up to 2000 Megohms and 1000 Volts D-C

HAND CRANK MEG TYPE

of Megger Insulation Tester is a reliable field instrument, light, sturdy, with a constant-voltage type generator—no dependence on batteries or other current supply. By far the most popular instrument among electrical plant maintenance men. Easy to use—easy to read—and rugged in constant services.

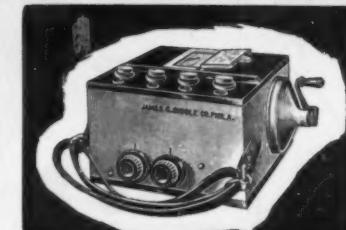
RECTIFIER OPERATED Meg Type

of Megger Insulation Tester simply plugs into a convenient outlet. Portable or flush bench-mounted. A dependable production or inspection instrument. Quick, easy readings speed up otherwise costly tests.

DUAL-OPERATED MEG TYPE
of Megger Insulation Tester may be operated by hand or rectifier. Excellent solution for those requiring a versatile instrument for field and bench use.



Write for
BULLETINS
21-45 ECM
21-46 ECM



INSULATION TESTER & WHEATSTONE BRIDGE in ONE EASILY PORTABLE INSTRUMENT

Measures Electrical Resistances
From a Fraction of an Ohm
up to 1000 Megohms

Affords the facility of:

- A Wheatstone Bridge for measuring conductor resistance of coils, resistors and circuits.
- A Megger Direct Reading Ohmmeter for measuring electrical insulation resistance (ohm and megohm scales).
- A Varley Loop Feature for locating faults on wires (optional).

This Bridge-Meg weighs only 15 lbs. and is completely self-contained with its own constant-voltage generator—no need to be dependent on batteries or other suitable test current.

Why burden yourself with two instruments when you can have the facilities of two for little more than the price of one in one compact, sturdy case. For complete details and prices write for BULLETIN 21-60 ECM.

IF YOU
MEASURE SPEED
• • •
YOUR BEST BET
IS BIDDLE



Instantaneous Speeds or Variations
in Speeds. Write for BULLETIN 35-ECM



Average
Measuring
RPM
or
FPM
Jagabi®
Speed
Indicator

Frahm®
Resonant
Reed
Tachometer
Quick
Accurate
Readings
with
Safety
BULLETIN
31-ECM



JAMES G. BIDDLE CO.

• ELECTRICAL TESTING INSTRUMENTS
• SPEED MEASURING INSTRUMENTS
• LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET
PHILADELPHIA 7, PA.

installed within sight of the controller location or it may be located at a distance not to exceed 50 feet from the controller location but still be in sight of the controller location.

It should be noted that the same, more or less applies to the location of the controller. See Section 4386.

The basic intent is to insure safe operation at the motor location when repair or maintenance work has to be done. If the controller and disconnect are within sight of the motor, the repairman or the maintenance man can always keep an eye on these devices to make sure he can work safely on the motor. In the event the controller and disconnect are located where he cannot continually supervise them while working on the motor, it is only necessary for him to open the disconnect and lock it in this position with a padlock and similar locking device. This then insures a dead circuit for the motor since most safety practice systems set up in plants permit the reenergizing of "locked out" circuits by only the person who originally "locked out" the circuit.—B.Z.S.

Remote Control— 2400-Volt—M-G Set

Q. I would appreciate a ruling from you on the following question pertaining to a pending installation. Is it permissible to start a motor-generator set, synchronous motor drive, 2400 volts, from a remote location?—J.J.S.

A. Section 4386 of the Code covers the conditions under which a motor controller may be located out of sight from the controller location. The fine print note preceding Section 4381 defines the term "controller" as follows: "For the purpose of this article, the term "controller" includes any switch or device normally used to start and stop the motor." Article 710 covers circuits and equipment operating at more than 600 volts and in the absence of any special requirement for remote control under this article, the rules covered by Article 430 would apply. Sections 4421-4425 cover the requirements for motors and controllers operating at a voltage in excess of 600 volts. Sections 4371 to 4374 and Article 725 cover the requirements for remote-control circuits.

A review of these various requirements indicates to me, as far as the N.E. Code is concerned, that there is no objection to the remote control of the 2400-volt synchronous motor-generator set covered by your question.—B.A.McD.



Incandescent and fluorescent light are combined to illuminate this exhibit of 16th and 17th Century English Art in glare-free, shadow-free lighting. Water-white curved lens panels and lenses blend the two types of light.

Architects—R. B. O'Connor & Aymar Embury II
Architects and Engineers—Voorhees, Walker Foley & Smith
Architects—Brown, Lawford & Forbes
Engineers—Edw. E. Ashley
Recessed Lighting Fixtures by Eastern Lighting Products, Inc.



Ceiling in this room is of specially designed panels of water-white crystal by Corning. Louvers of Alba-Lite shield directional lighting used to highlight centers of attention.

How Metropolitan Museum created natural lighting for great art exhibits

Visitors to New York's "new" Metropolitan Museum now enjoy the world's great art treasures in shadow-free, glareless lighting.

In his role as the Museum's consulting engineer for the \$9,000,000 restoration program, Laurence S. Harrison sought to create a lighting system approaching the ideal qualities of daylight in the exhibit rooms and corridors. He achieved his aim with a combination of incandescent and fluorescent lighting, skylights and a wide variety of Corning Engineered Lightingware.

Corning developed a new water-white crystal glass with true color transmission characteristics to meet exacting specifications. This glass in 2-ft. square panels is installed in the skylight ceilings, in the second floor galleries. Formed into curved prismatic lens panels, it is also used extensively in recessed fluorescent troffer fixtures in lighting the first floor galleries.

True colors assured

Corning Alba-Lite glass because of its ability to diffuse and transmit fluorescent light without altering

color is used in the fixture installed in the ground floor galleries.

Corning's PYREX brand "Double-Tough" Lenses are used to direct the light from incandescent lamps. They resist both thermal and impact shock.

You find the answer to a great variety of lighting problems in Corning Engineered Lightingware. To learn more about the many kinds of Corning lightingware available, write for Bulletin LS-43, "Architects and Engineers Handbook of Lighting Glassware."



CORNING GLASS WORKS
CORNING, N. Y.

Corning means research in Glass

CORNING GLASS WORKS, Dept. EC-10, Corning, N. Y.

Please send me a copy of the "Architects and Engineers Handbook of Lighting Glassware."

Name.....

Title.....

Company.....

Address.....

City..... Zone..... State.....

Beautiful, Practical Lighting

the new **LUME-GLOW**

by **MITCHELL**



IDEAL LUMINOUS SEMI-INDIRECT COMMERCIAL LUMINAIRES

New MITCHELL "Lume-Glow" sets the standard of excellence in comfortable indirect lighting. It is specifically designed for low brightness contrast and features pleasing eye-ease illumination. Designed for pendant mounting,

Lume-Glow luminaires achieve a desirably high upward component coupled with diffused downward lighting to achieve this new concept in glare-free, restful illumination. The superb combination of abundant light output with low surface brightness is achieved through the original use of polystyrene plastic formed in an ultra-shallow streamlined contour of unusual beauty and distinction. Finally, "Lume-Glow" offers exceptional advantages in simplified installation and maintenance. For full details, specifications and performance data, write for Bulletin No. 4.

where quality counts,
specify

MITCHELL

MITCHELL MANUFACTURING CO.

2525 N. Clybourn Ave., Chicago 14, Illinois

In Canada: Mitchell Mfg. Co., Ltd., 19 Waterman, Toronto

★
The "Evenglo" plastic diffusing shield provides the most desirable low surface brightness

★
High upward component, combined with plastic diffusing shield, provides the eye-ease illumination of indirect lighting

★
Ultra-shallow contour achieves a smart, streamlined effect to create clean, tailored-looking installations in the most distinguished interiors

★
Available in 4-Foot, 2-Lamp or 4-Lamp Luminaires (choice of Rapid Start, Slimline or Medium Bi-Pin), and in 8-Foot, 2-Lamp or 4-Lamp Slimline. Matching Spots, Fill-Ins and Corner Boxes are available

Modern Lighting

Coined Cross Louvers Reduce Fixture Brightness

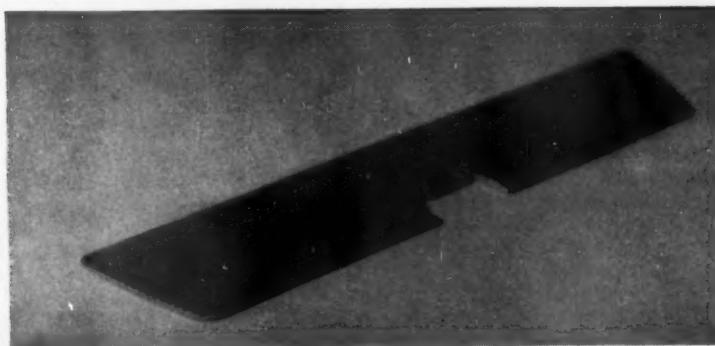
Low head room between floor slabs and the underside of deep structural beams created a lighting problem of considerable magnitude when a downtown Cleveland garage building was recently converted to supply additional office space for the Standard Oil Company of Ohio. This problem was understandable, since the necessity for obtaining high-intensity illumination without glare for critical-seeing tasks in the accounting department seemed a difficult objective with conventional

lighting fixtures. That the problem was satisfactorily solved is due largely to the installation of Para-Louvers as a lateral shielding medium in Day-Brite Alzak aluminum troffers; a solution that reduced troffer brightness by 50% in the lengthwise direction, yet did not noticeably affect the overall efficiency of the system.

The combination of deep parabolic cross-section reflectors and Para-Louvers permitted use of flush-mounted troffers without the usually



LOW BRIGHTNESS provides eye comfort from all viewing angles, since deep parabolic troffers and coined parabolic cross louvers combine to reduce fixture brightness to a maximum of .6 candles per square inch, measured along the longitudinal axis of the troffers.



PARA-LOUVERS are die struck under pressures of 900 tons, creating series of horizontal closely-spaced parabolic segments that diffuse light emanating from the lamps. Ridges on one side correspond with troughs on the other side of the louver, thereby conserving metal and reducing overall thickness.



IN CORRIDORS, the same basic fixture is used, with a 5-foot interval between each 4-foot 2-lamp lighting unit. Although mounting heights are so low that fixtures may easily be touched with an upraised hand, lamp brightness is comfortably reduced by the etched aluminum Para-Louvers.

attendant problems of uneven light distribution at the working level.

In design, the louvers selected contain series of horizontal closely-spaced parabolic segments, the pattern of reflecting surfaces being die-struck under a pressure of 900 tons, and the parabolic surfaces being so staggered on opposite sides of each louver so that a ridge on one side corresponds with a trough on the other, a procedure which keeps overall thicknesses of louvers at a minimum. This design strengthens the louver while reducing the amount of metal required. It also minimizes inter-reflection, and surface brightness is reduced because light striking the louvers from the lamps above them is reflected either downwards towards the working surfaces or upwards above normal viewing angles.

This solution, although simple in basic logic, provided a long-sought answer to SOHIO's problem, and the resulting installation is so comfortable to the eye that visitors to the office find it difficult to realize that the soft diffusion is from etched aluminum louvers. Since ceiling height is only 7 feet 9 inches and spacing of troffers is 6 feet on centers, the obtained results are commendable, meriting commendation from all employees working beneath this installation.

Specify
Acusti-luminous
ceilings!



for LOW-COST
CONTROL of
LIGHT, SOUND
and AIR FLOW

**THE OVERALL CEILING OF
LIGHT THAT INCREASES
OVERALL EFFICIENCY!**

Here is the trend in modern lighting! A solid ceiling of light that provides soft, shadowless illumination and also hides pipes, ductwork and sprinkler systems — it modernizes old and new buildings!

Made of unbreakable, corrugated LUMI-PLASTIC with noise absorbing ACUSTI-LOUVERS, it is glareproof, clean and easy to keep clean—labeled by Underwriters' Laboratories for installation under existing sprinkler systems!

Its low cost is quickly offset because people see better, feel better, work better under an ACUSTI-LUMINUS CEILING. Already over 3500 in use.

Luminous Ceilings, Inc.

Dept. 31 2500 W. North Ave., Chicago 47, Ill.

Tell me where I can see it!

Send me your free booklet containing complete details about the ACUSTI-LUMINUS CEILINGS!
Name and title _____

Firm name _____

Address _____

City & State _____



LUMINOUS CEILING over reading area and recessed troffers in stack area make reading and study easy in the Amelia Hutchings Memorial Library, Macon, Georgia.

Library Modernizes with Light

A new lighting system keynotes the remodeling of the Amelia Hutchings Memorial Library in Macon, Ga., recently completed. It consists of a luminous ceiling over the general reading and study area, of recessed louvered troffers in the stack area, and of recessed down lights over the librarian's desk. Remodeling plans also included rewiring, installation of new floors, furniture, and painting throughout.

This library, owned by the city of Macon, has long been used by Negroes of the community exclusively. It is modern in every respect, and is the first building in the entire community to be lighted by a luminous ceiling.

The ceiling lighting, supplied by Luminous Ceilings, Inc., consists of corrugated vinyl plastic sheets 36 inches wide, and lengths as required.

supported in metal T-tracks, with rapid start 40-watt fluorescent strip lights spaced on 36-inch centers and installed 24 inches above the plastic. This arrangement provides an intensity of 50 footcandles, and "it seems as if night never comes because the lighting gives the daylight effect at all times," in the opinion of Mrs. Mae Evelyn Greely, assistant librarian. The recessed troffers and down lights were supplied by DayBrite Lighting, Inc.

The Dozier Electric Company installed this new lighting installation and did the rewiring of the entire building. N. J. Pascullis was the architect. C. A. Crowell, of the architect's office, and Wade B. Evans, lighting engineer for the Georgia Power Company, cooperated in working out the lighting design.

Quality Lighting Fosters Quality Printing

An intensity of 60 footcandles of well diffused lighting is provided in the print shop at the Georgia School for the Deaf, at Cave Spring, Georgia. This intensity was decided on for two principal reasons: 1) the students are more than normally dependent on their eyes because of their handicap of being deaf; and 2) they are wholly dependent on their eyes for safety, an important factor in any classroom activity which involves student operation of moving machinery.

In addition to giving vocational

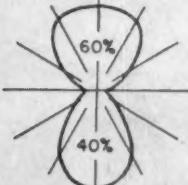
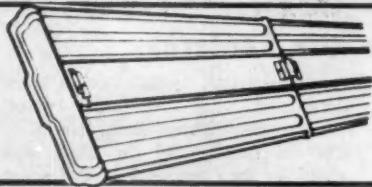
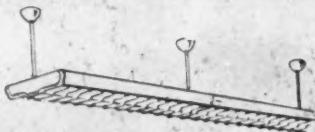
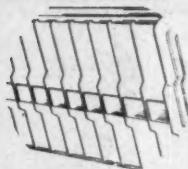
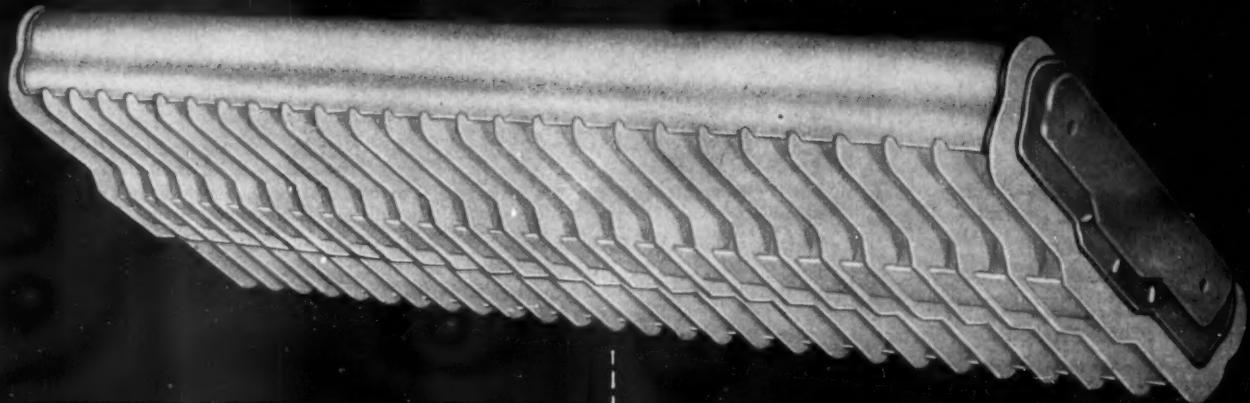
training to the students in the print shop, the students also do job printing for the State of Georgia. The high-level, glare-free lighting is of material assistance in the production of quality printing which the students at the school are taught to do. The school printing instructor, W. H. Crider, feels that both quality and intensity of light are important, not only in printing, but also in teaching deaf children the fundamentals of the trade.

The newly constructed print shop is lighted with continuous rows of 2-lamp

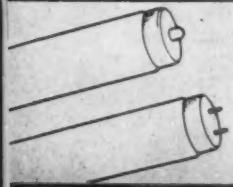
Flexibility PLUS

FOR TODAYS MOST EFFICIENT COMMERCIAL LIGHTING

Wheeler FLO-LINER



A quality fixture throughout!



FIXTURES — 2 lamp and 4 lamp units available for 48 inch 38 watt and 96 inch 74 watt single pin lamps, as well as 48 inch 40 watt bi-pin lamps.

SHIELDING — All fixtures provide 45° cross-wise shielding and are available with choice of 25° or 45° lengthwise shielding.

END CAPS — Satin finish aluminum end caps available — order separately.

PENDANT MOUNTING — Stem hanger assemblies are required. Single stem hangers used for continuous row mounting. Twin stem hangers for the mounting of individual 48" lamp fixtures.

SURFACE MOUNTING — Units may be attached directly to the ceiling. Available as optional equipment are surface mounting plates and top reflectors.

85% EFFICIENCY — Translucent plastic side panels and center panel give low brightness for more comfortable seeing and high efficiency. Made of sturdy Polystyrene, they will not warp or discolor. For further seeing comfort 60% of the light is directed above the horizontal.

DISTRIBUTED EXCLUSIVELY



THROUGH ELECTRICAL WHOLESALERS

Wheeler REFLECTOR COMPANY
275 CONGRESS STREET, BOSTON 10, MASS.

for the **LONG PULL** use

Y-ER EAS
Wire Pulling Lubricant

Only Y-ER EAS has all these features

Write for descriptive booklet

GIVES THE SLIP TO-

Lead, Rubber, Braid or
Synthetic Covered Cables

Improved Y-ER EAS tested and approved by the
Underwriters' Laboratories, Inc.

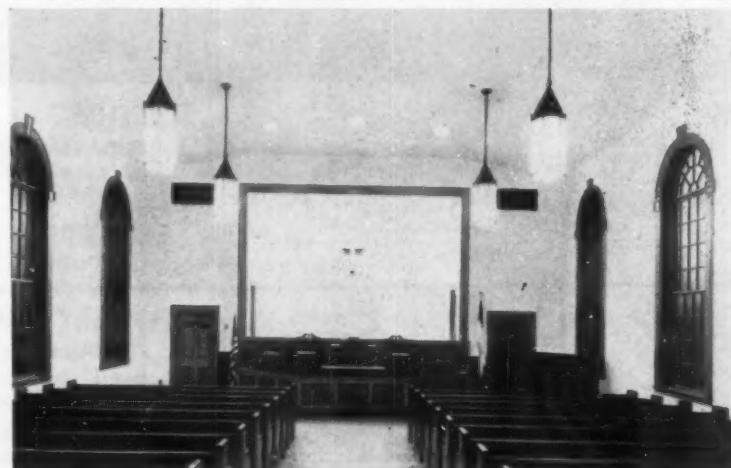
AT ALL LEADING ELECTRICAL SUPPLY HOUSES

ELECTRO COMPOUND CO.
3818 W. 150th St., Cleveland 11, Ohio



PRINT SHOP in the Georgia School for the Deaf at Cave Spring, Ga. is lighted to 60 footcandles to enable handicapped students to see easily and quickly.

96-inch slimline direct-indirect luminaires spaced eight feet apart, and suspended about 30 inches below the light finished ceiling. The luminaires are louvered to eliminate direct glare from the units and are of the Pittsburgh Reflector Company's "Monroe" type equipped with metal side reflectors.



Church Relights with Lanterns

When the Mize Memorial Methodist Church in Augusta, Georgia, relighted recently, they selected lanterns to do the job. The church had been lighted previously with indirect luminaires, and while the lighting quality was good, the amount of light delivered was too low for seeing comfort. Also, the pastor and church members wanted luminaires with a design which would create a "churchly" atmosphere.

This problem was solved easily by Lyman Robertson, architect, and Walter S. Smith, Jr., Georgia Power Company lighting engineer, who cooperated in the selection of the luminaires and amount of light to be used. Six hanging Novelty Electric Com-

pany lanterns of Gothic design were selected to light the church pews. Three recessed incandescent lens units light the pulpit, and the choir was lighted by two recessed incandescent units and a row of 2-lamp slimline fluorescents concealed.

The lanterns each contain one 500-watt lamp for down lighting, and three 100-watt lamps for lighting the hammered glass diffusing panels in the side of the lanterns softly. With the ceiling and side walls finished in light colors, the light is diffused throughout the area and a very pleasing lighting effect is created. Members and church visitors agree that the lighting is most satisfactory.

Slash Motor Maintenance

Speed Installation

Increase Brush Life

Cut Motor Down Time



MULTIFLEX brushes with NEOPRENE pads

... really protect your motor and generator investments. Engineered for better contact and reduced vibrations, Helwig Multiflex brushes eliminate uneven wear and reduce circulating current. Get multiple brush operation without expensive changes. The key to longer commutator life is a quality brush designed to FIT, instead of a cut-down, so-called standard brush. Save production time and money with Helwig tailor-made brushes. Write for details on the Helwig brush inventory control plan.

HELWIG CO.
CARBON
PRODUCTS
2502 N. 30th Street
Milwaukee, Wisconsin



would your customer turn down a savings of \$4,000 on a \$40,000 lighting expenditure?

Your customers can enjoy the benefits of the *finest* lighting money can buy and effect really substantial savings at the same time, simply by buying the *right* lighting fixture. Time and again, the better design and efficiency of Smithcraft Fluorescent Fixtures result in *fewer units* to produce recommended lighting levels.

Here's an actual case history of how a Pennsylvania department store saved 10% in initial costs and 10% in operating costs . . . or approximately \$4000 on a ten-year \$40,000 expenditure.

Before re-lighting, a complete survey was made and exact lighting requirements were established. To meet these requirements, Smithcraft units and units of several nationally-known top quality

manufacturers were subjected to an exhaustive comparative analysis. Here are the results:

10% FEWER UNITS REQUIRED

Number of units required to achieve recommended lighting levels: Smithcraft — **270**
2nd Best Fixture — 297
3rd Best Fixture — 339

10% LESS INSTALLATION COST

Proportionately less labor and materials were required to install the 270 Smithcraft units than the 297 units of the nearest competitor.

10% FEWER LAMPS

(Initial & Replacement)

Lamps required: Smithcraft — **706**
2nd Best Fixture — 776
3rd Best Fixture — 914

Recommended practice is to replace lamps every 18 months—a continuing 10% savings.

10% LESS POWER CONSUMPTION

Required wattage: Smithcraft: 51.3 kilowatts
2nd Best Fixture: 56.3 kilowatts
3rd Best Fixture: 64.8 kilowatts

Whether you're lighting a store, office, school, factory, or institution, it pays to *buy lighting—not fixtures*. Invest in Smithcraft—America's Finest Fluorescent Lighting Equipment.

PHOTOGRAPH SHOWS AN INTERESTING PATTERN ARRANGEMENT OF THE SMITHCRAFT LOUVERLITE SLIMLINE IN THE PENNA. DEPT. STORE DESCRIBED ABOVE.



BUY LIGHTING—NOT FIXTURES. **INVEST** IN AMERICA'S FINEST FLUORESCENT LIGHTING by

Smithcraft

LIGHTING DIVISION
CHELSEA 30, MASSACHUSETTS

*Lighting that makes the nation's most important buildings come alive



Williamsburgh Savings Bank, Brooklyn
Troffer Series 25-4 with Metal Louvers
Trowler & Sushan, architects-engineers;
Lincraft Constr. Corp., gen'l contractor;
Standard Light'g Fix. Co.

Hydrox Sealtest Ice Cream Co., L.I.C.
Troffer Series 25-1; 9032 Controlens*
L & P Elec. Constr. Co., elec. contractor

SOME IMPORTANT ORGANIZATIONS NOW USING PHILITE "SERIES 25" TROFFERS

Bethlehem Steel Corp.
Camden National Bank
Detroit Neuropsychiatric Hospital
Doughnut Corp. of America
General Acceptance Co.
General Foods Corp.
Johns-Manville Corp.
Link-Belt Co.
Newark Airport
NYC Public School No. 172
Rohm & Haas Co.
University of Pennsylvania
Warner-Hudnut, Inc.
Webb & Knapp, Inc.

Leading organizations in every field of endeavor are specifying Ruby-Philite today to gain maximum efficiency from their lighting installations. They have found that Ruby-Philite luminaires provide desired levels of illumination with a minimum of distracting glare or brightness . . . often at substantial savings realized thru higher luminaire efficiency and lower installation costs. You, too, will find it easier to make your buildings come alive with proper lighting when you specify Ruby-Philite. Write now for complete catalog data.

*SERIES 25 TROFFERS • Available in 8 different shieldings for recess installation in any type of ceiling.



Ruby-Philite Corp.

32-02 QUEENS BLVD., LONG ISLAND CITY 1, N. Y.

In The News

IES National Technical Conference Held

Lighting progress and engineered environments were subject highlights at the 1954 National Technical Conference of the Illuminating Engineering Society, held September 13-17 at Atlantic City, N. J. Other session topics included light sources and controls, lighting calculations, quantity and quality, work area, street, and residence lighting, lighting applications, and a civil defense lighting symposium. More than 800 members and delegates from the United States, Canada and other countries registered for this five-day annual conference affair. The Society's Philadelphia Section, home of its 1954 President, was host to these scientists and engineers of the lighting industry.

The Conference's opening session was presided over by C. N. Laupp, Wisconsin Electric Power Co., and chairman of the National Technical Conference Committee. The guests were welcomed to the convention city by Hon. Joseph Altman, mayor of Atlantic City, and by B. L. England, president of Atlantic City Electric Company, on behalf of the electrical industry on this 75th anniversary of the invention of the electric lamp in 1879 by Thomas A. Edison. Mr. England complimented the lighting engineers for their major role in advancing the quantity and quality of lighting which has played such an important part in improving the economic, social and industrial life in America.

A. Homer Manwaring, President of IES and executive vice president of Philadelphia Electrical & Mfg. Co., presented the annual President's report, in which he commended the Regional Conference committees for their excellent programs in New Orleans, Houston, Denver, San Francisco, Seattle, Toronto, Detroit, Hartford and St. Louis. He stressed the importance of these Regional Conferences to the IES membership nationally, including the continuous flow of lighting knowledge and information developed by the Society's technical and application committees to the membership and through them to the service of the public.

Duncan M. Jones, IES President-elect, spoke as vice president of the Society, and stressed the importance of



RECIPIENT of the 1954 IES Gold Medal, highest honor of the Illuminating Engineering Society, was Dr. Erwin F. Lowry of Sylvania Electric Products Inc., Salem, Mass. (second from right). Presentation was made at annual IES National Technical Conference, Atlantic City, N. J. on September 13 by A. Homer Manwaring, IES President, as Walter Sturrock (left), Chairman of the IES Gold Medal Award Committee, General Electric Co., Lamp Department, and Arthur A. Brainerd, Philadelphia Electric Co. illuminating engineer (right) add their congratulations.

maintaining and developing the scientific, technical and professional aspects of the Society's program. He is the first Canadian to serve as leader of IES.

First technical session was devoted to the Living Environment. R. B. Newman, of Cambridge, Mass. discussed the acoustic environment in terms of its effects on human beings. Nathaniel Glickman, of Miami Beach, Florida, discussed optimum conditions for human comfort under the broad aspects of thermal environment. L. C. Kalf, general art director for Philips Glowlamp Works, Eindhoven, Holland, discussed the luminous environment and expressed our visual aim as human well-being and comfortable.

A principal event of the entire conference was a report on lighting Progress, in which all the advances in light sources and equipment and their applications made during 1953-54 were reviewed. This two-and-one-half hour program was presented by Eugene Beggs, of Westinghouse Electric Corp., chairman of the Society's Lighting Progress Committee.

Two outstanding light and vision specialists gave reports on current standards of quality and quantity for interior illumination. Dr. H. R. Blackwell of the University of Michigan discussed "Quantity of Light" and Dr. S. K. Guth, Director of Lighting Re-

search for General Electric Co., Cleveland, discussed "Quality of Lighting".

One session covered residence lighting, in which an analysis of twelve solutions to a home-lighting problem was made by three speakers, and on which C. E. Stephenson, interior and industrial designer and president of American Institute of Decorators gave a technical paper on Home Lighting and Home Decoration.

Other technical papers covered a variety of subjects, ranging from Cold Cathode Lamp Characteristics to Ballast Applications, to Electric Discharge Lamps in Street Lighting Service, to Economic Lighting for Today's Industry, to Church illumination for the Various Types of Services. One highly interesting session was a symposium on Lighting for Civilian Defense, participated in by Col. Barnett W. Beers, Assistant for Civil Defense, Washington, D. C., Phillip Batson, Federal Civil Defense Administration, Washington, D. C., and J. C. Forbes, General Electric Co., Nela Park, Cleveland.

At the opening session, President A. H. Manwaring presented the IES Fellow emblem to ten members of the Society who were elected to this membership grade this year for outstanding technical competence. These members were presented to the President



**BEWARE
THIS
REVOLTING VOLT-URE**

The revolting Volt-ure perches in plants and pecks away at profits, unless you see to it that good lamp maintenance is constantly observed*, and that you are well supplied with lamps of unquestioned quality — efficient, dependable, long-lasting CHAMPION Lamps.

*Simple, practical suggestions for making the most of your lamps and lighting are contained in the *Champion Maintenance Manual*. May we mail you a free copy?



CHAMPION LAMP WORKS

594 Broad Street, Lynn, Massachusetts



IES President-elect Duncan M. Jones (right), of Curtis Lighting of Canada, Ltd., Montreal, receives congratulations from A. Homer Manwaring, President of IES during the past year and Vice-President of Philadelphia Electrical & Mfg. Co., Philadelphia, as Marshall N. Waterman, IES Vice-President-elect, Westinghouse Lamp Division, Bloomfield, N. J. looks on.

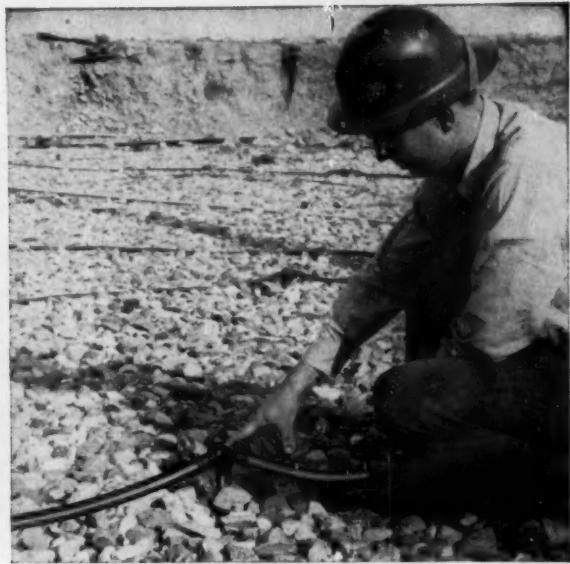
for this recognition by A. A. Brainerd, chairman of the Board of Fellows. They were: C. E. Egeler, General Electric Co; Myrtle Fahsberger, Westinghouse Electric Corp., Lamp Division; D. M. Finch, University of California; Kurt Franck, Holophane Co., Inc; K. S. Gibson, National Bureau of Standards; J. J. Neidhart, Westinghouse Electric Corp.; R. L. Oetting, General Electric Co; R. A. Palmer, Duke Power Co; C. H. Rex, General Electric Co; and F. D. Wyatt, Chicago Park District.

Final run-off of the "My Most Interesting Lighting Job" contest, sponsored by the Society during the past year, was held as part of the Conference activities. There was one contestant from each Region participating. First prize was won by Floyd Sell and Duncan Preston, Detroit Edison Co., for their joint entry on a "Special Application at the Detroit Plating Company". Second prize went to J. J. Tynan, Atlantic City Electric Co., for his "Floodlighting an Office Building" entry. Third prize was won by Louis N. Goodman, L. N. Goodman Associates, New Orleans, La., for an entry on "Lighting the Lobby and Waiting Concourse of the New Orleans Union Passenger Terminal."

Other contestants in the final competition run-off were: Leon T. Johnson, Public Service Electric & Gas Co., Newark, N. J.; Eric Ackland, Eric Ackland & Associates, Ltd., Vancouver, B. C.; P. A. Ducasse, Quebec City, Quebec; E. H. Schaeffer, Wisconsin Electric Power Co., Milwaukee, Wise; Starr V. Monsee, City of San Diego, San Diego, Calif.; and (not present) Lyle M. Bailey, Albert Schaeffer Mfg. Co., Denver, Colo.; and Floyd Covington, Post Engineers, Fort Sam Houston, Texas.



The "grounding loop"—a neoprene-jacketed conductor buried around periphery of building—is welded to the building column. Sunlight, heat and exposure have little effect on the durable neoprene covering.



One of the grounding beds. Neoprene-jacketed wire connects the steel rods, and at each joint, rugged neoprene tape is used to seal out dirt and moisture. Both jacketing and tape resist soil acids.

Neoprene jacketing protects over 47 miles of wire against galvanic action at Fairless Works

At U. S. Steel's gigantic Fairless Works near Morrisville, Pa., grounding rods of steel instead of the usual copper were installed to prevent galvanic corrosion of building columns. Over 47 miles of neoprene-jacketed grounding wire link the buildings to the rods.

The durable neoprene jacketing provides sufficient insulation to prevent galvanic action between the wire and buried steel . . . and it resists any deterioration due to direct burial in earth. Welded to alternate building columns, the neoprene-jacketed wire runs underground to the steel rods . . . provides an efficient grounding system—a permanent guard against galvanic corrosion.

Some 107 miles of neoprene-jacketed wire and cable serve the Fairless Works in a number of ways. Power distribution, for example, is handled by underground cables jacketed with neoprene over lead. Here again, neoprene's resistance to soil acids and



galvanic currents means long, trouble-free service. **YOUR SUPPLIER** is the man to see about dependable neoprene-jacketed wire and cable for *all* installations—whether above ground, in conduits, or in the ground itself.

FREE! THE NEOPRENE NOTEBOOK—Each issue describes interesting new applications of neoprene . . . new products . . . on-the-job reports. Just mail the coupon below to get on the mailing list.

MAIL THIS COUPON TODAY!



E. I. du Pont de Nemours & Co. (Inc.)
Rubber Chemicals Division EC-10
Wilmington 98, Delaware

Please send me the Neoprene Notebook regularly.

Name Position

Firm

Address

City State

NEOPRENE

The rubber made by Du Pont since 1932



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

five happy men



and **GARCY'S** new 5600 Series Recessed Lighting

2' x 2'

2' x 4'

4' x 4'

2' x 8'

Variety in size and in
number of lamps

2 ft. wide units for 2, 3 or 4 lamp rows; 4 ft. x 4 ft. units
for 6, 8 or 10 lamp rows. Rapid start, slimline or
fluorescent lamps.

For any type of ceiling construction
plaster, aluminum grid and others

"The big five" on any lighting job, range
from the man who pays the bills to the
architect who picks the fixture.

Garcy's 5600 Series, by design, provide
the kind of desirable features that make
'em happy, and keep them that way.

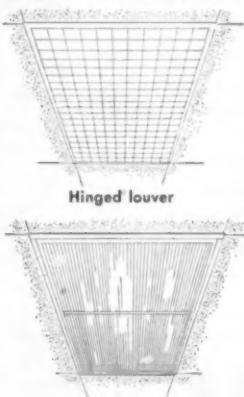
Design and lighting flexibility win a
pleased nod from architects and engi-
neers. Easy installation in any type of
ceiling scores with contractors. Easy
maintenance is a big feature for those
concerned with upkeep. And the man
who pays the bills is mighty happy with
the handsome appearance and long-life
construction details.

"Quality . . . by design" in Garcy's
5600 Series fixtures has the knack of
pleasing everyone. Send for bulletin
L-146.



NEW!

THREE TYPES OF SHIELDING (Hinged plastic pictured above)



GARCY

Quality by Design

Garden City Plating & Mfg. Co., 1730 N. Ashland Ave., Chicago 22, Ill.

In Canada: Garcy Co. of Canada, Ltd., 191 Niagara St., Toronto



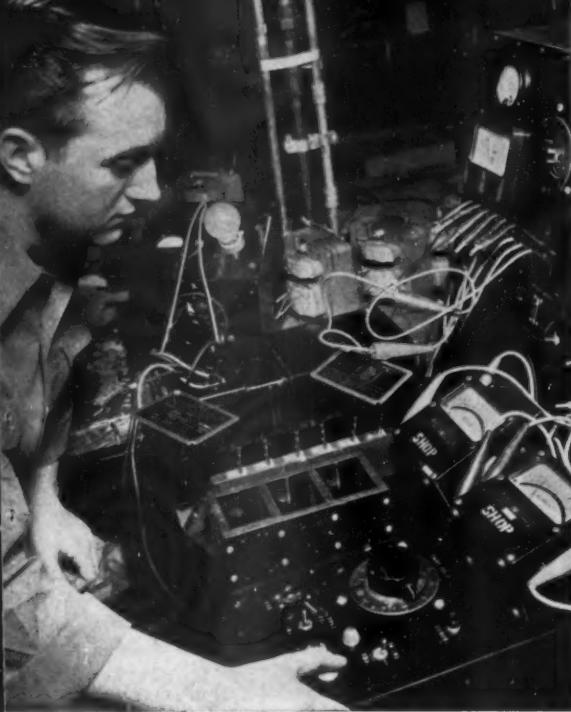
SCHWARTZ AND LINDHEIM of Oak-
land, Calif., better known to their cus-
tomers and employees as Bob and Steve,
are relative newcomers to the contracting
field although their general savvy, pro-
gressiveness and engineering methods
predict a long, bright future for this team.

Diamond Jubilee Farm Sets Standards for Electric Utilization

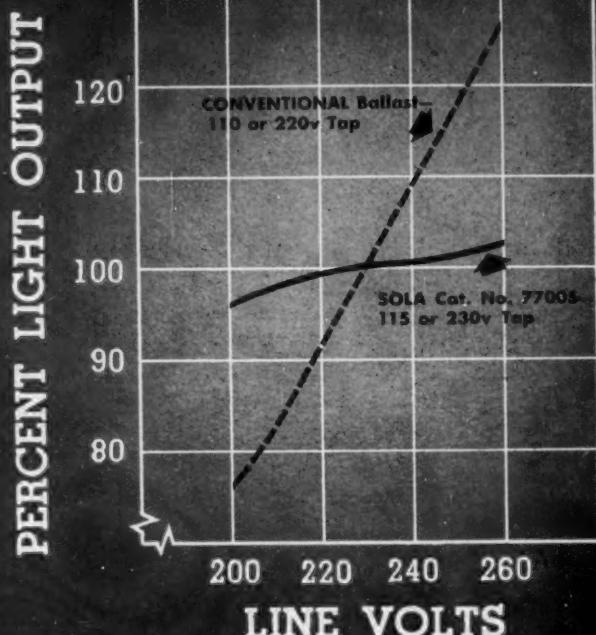
Farm electrification—promoted vig-
orously during the past few decades
by numerous agencies and associations
—received a healthy shot in the arm
recently when a Pennsylvania dairy
farm near Harrisburg went "whole hog"
towards thorough, practical, safe
and convenient power distribution and
utilization. Owned and operated by
John Stamy, the farm was selected by
Farm Journal as a means to dramatize
their commendable campaign for "bet-
ter farming and better living . . .
electrically". Cooperatively sponsor-
ing the project was the Pennsylvania
Power and Light Company, NECA,
NEMA and numerous manufacturers
who collectively contributed power
tools, electric appliances, materials and
engineering services. Electrical con-
tractor on the job was the Howard P.
Foley Company of Harrisburg.

Timed to coincide with the 75th
anniversary of the electric light, this
project is receiving national publicity
under the label of Operation Big
Switch on the Diamond Jubilee Farm.
And, as far as practically feasible,
this "dream farm" represents the high-
est standards in electrical operation.

The farm is outstanding as to wir-
ing adequacy—both for present and
future needs—with a 500MCM prim-
ary service and a 37.5-kva single
phase 115/230-volt transformer in-
stalled for this purpose. The comfort-
able 7-room farm house has a 150-amp
breaker and 56 active circuits on the



PRODUCTION LINE TESTING OF REGULATING ACTION:
Every Sola Constant Wattage Mercury Vapor Transformer is individually adjusted and tested to assure regulation of light output.



LIGHT OUTPUT REGULATION COMPARISON: The curves above compare the light output from an EH-1 mercury vapor lamp operating from a conventional non-regulating transformer against a Sola Constant Wattage Transformer under varying values of line voltage.

Mercury vapor lamps operate at full rated light output with Sola Constant Wattage Transformers

You get all the lumens you pay for, when your mercury vapor lamps operate from Sola Constant Wattage Transformers. These regulating ballasts continuously and automatically maintain lumen output within $\pm 2\%$ regardless of line voltage fluctuations as great as 25%.

You benefit from other important operating advantages resulting from the Sola constant wattage circuit:

- Positive starting within the primary ranges of 100/200-130/260v without need for primary taps.
- Negligible starting line current surge, eliminating need for time-delay relays, oversize circuit breakers and oversize wiring.

WRITE FOR BULLETIN 17J-MV-208 FOR COMPLETE DATA

SOLA *Mercury Vapor Lamp*
TRANSFORMERS

- Virtual elimination of outages from line voltage drops since primary voltage must fall below 70v on a 115v circuit before lamp will extinguish.
- Protection on open and short circuit by limiting current under abnormal operating conditions (lamp failure or load short circuit).
- Extended lamp life resulting from stabilized operation.

The moderate differential in original cost, over conventional non-regulating ballasts, is often eliminated by installation savings and by continuous high quality of performance you realize from your mercury vapor lighting installation. Write for the facts.



REGULATING
OUTDOOR



REGULATING
INDOOR



CONVENTIONAL
INDOOR

CONSTANT VOLTAGE TRANSFORMERS for Regulation of Electronic and Electrical Equipment • **LIGHTING TRANSFORMERS** for All Types of Fluorescent and Mercury Vapor Lamps. • **SOLA ELECTRIC CO.**, 4633 West 16th Street, Chicago 50, Illinois, Bishop 2-1414 • **NEW YORK** 35: 103 E. 125th St., Trafalgar 4-6464 • **PHILADELPHIA**: Commercial Trust Bldg., Rittenhouse 6-4988 • **BOSTON**: 272 Centre Street, Newton 58, Mass., Bigelow 4-3354 • **KANSAS CITY** 2, Mo.: 406 W. 34th St., Jefferson 4382 • **Representatives in Principal Cities**



'Exposed conduit jobs made more attractive with portable Greenlee Hydraulic Bender'

Here's the experience reported by Canadian Comstock Co., Ltd., Montreal electrical contracting firm, in using GREENLEE Benders on the above job involving installation of conduit in sizes ranging from $1\frac{1}{4}$ " to 4".

Through the use of GREENLEE Benders this company reports that it is easy to make matched bends in multiple conduit installations and make exposed jobs more attractive.

Also by bending conduit they eliminate manufactured elbows and other fittings and thus make possible good use of standard 10-foot lengths. Since it is not necessary to cut the conduit at every turn, many short, useless lengths are done away with and it

is easier to calculate the entire amount of conduit needed. Like this firm, which has 27 GREENLEE Hydraulic Benders in use, you, too, can make valuable savings and turn out better jobs with this remarkable tool.

With the GREENLEE Bender, *one man* quickly makes smooth, *accurate* bends in pipe up to 5", rigid and thin-wall conduit, tubing, bus bars. Available in two sizes. Often pays for itself on the first few jobs through big savings of time and materials. Write for facts today. Greenlee Tool Co., 1750 Columbia Ave., Rockford, Illinois.



OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK

Hand Benders • Joint Borers • Cable Pullers • Knockout Tools • Auger Bits and Drills



MANAGER of electrical construction is the title and responsibility of D. T. Lambert, estimator-engineer at Jones Electric Company in Muskegon, Mich. Work under his supervision runs the gamut of commercial, industrial and residential; keeps a crew of 20 to 40 electricians busy.

main panel (with provisions for 24 additional breakers when and if needed at a later date). The largest of several barns is served by a 30-circuit lighting panel and a 12-circuit power board, while additional 16- and 18-circuit assemblies provide power and lighting control for a modern shop, granary, milk house, garage and storage building plus calf, bull and hog pens, brooder and laying houses.

All panels at present have spare circuits to permit distribution expansion, and all circuits in use are loaded only to partial capacity.

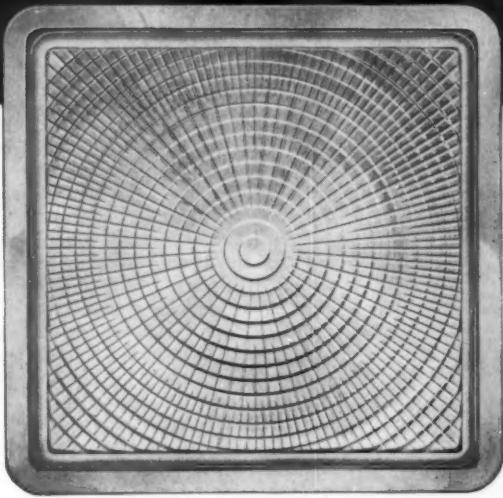
These provisions for wiring adequacy incorporate over a mile of rigid conduit and over 5 miles of cable—much of it having thermoplastic insulation as insurance against moisture, soil acids and usually prevalent normally-destructive barn atmospheres.

Maximum safety is also stressed in the wiring system, with dust-proof lighting units and enclosed motors in numerous locations, and with NEC standards consistently exceeded. As to convenience of control, the Stamy farm has installed numerous 3- and 4-way switches to provide continuous paths of light; ventilation and heating units are thermostatically regulated, and many lighting and heating units are activated by automatic time clocks.

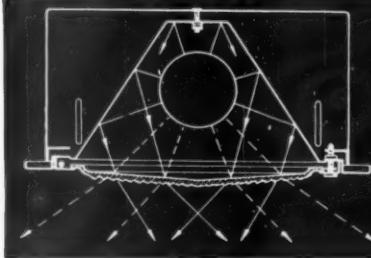
In the main house are 51 silent-operating wall switches for convenient control, 88 receptacles for plug-in service, plus 33 incandescent and 19 fluorescent lighting fixtures (some with dimmers to facilitate the selection of exact levels of illumination for various activities or moods).

Hot water is provided by an 80-gallon electric water heater and the completely electrified kitchen and utility areas are equipped with such servants as a range, refrigerator,

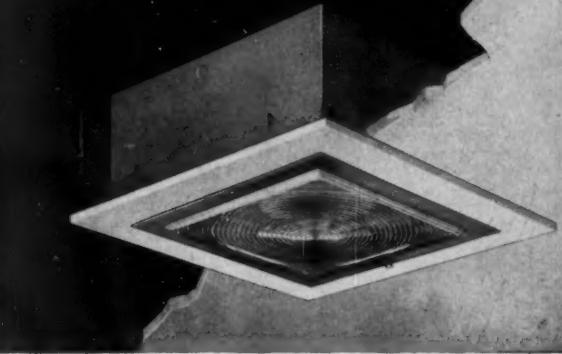
ART METAL advanced ELIPTISQUARE



**advanced
ELIPTISQUARE**
Multiplies Light Output

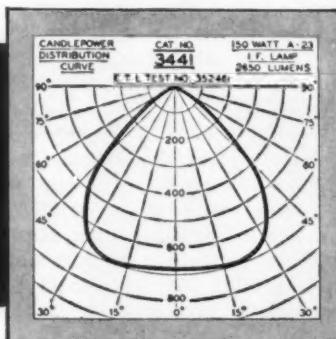


Eliptisquare reflector redirects all box-enclosed light downward through AMCOLENS to multiply lamp light utilization.



with clear, prismatic **AMCOLENS**

- Lighted objects reflect their true color value
- Highest light transmission efficiency
- Precise light direction control
- Edge light to ceiling for visual comfort
- Shallow recessed lens lighting

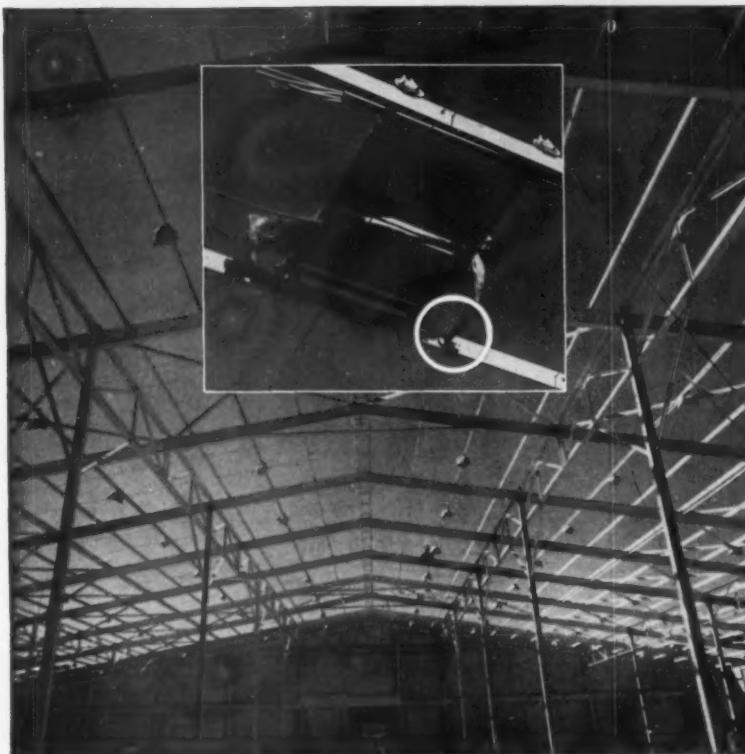


Please notice that the candle-power distribution curve is by Electrical Testing Laboratories, Inc., not The ART METAL Company.

May we send Bulletin 254 which gives complete details?
Please write:

THE **ART METAL** COMPANY
CLEVELAND 3, OHIO

Manufacturers of Engineered Incandescent Lighting



Tough fastening job made easy... costs reduced and time saved with high-speed *Ramset System*

Some 40,000 fastenings were required to install conduit and overhead lights in the warehouses of the Naval Air Station at Alameda, California.

Instead of welding or drilling holes for bolts, operators rolled along on movable platforms and anchored $\frac{3}{8}$ " steel angle plates with light, easy-to-use RAMSET JOBMASTERS and Tru-Set drive pins. Fixtures were then hauled up and fastened to the plates. Each bay of the 800-foot-long warehouse was completed in less than four days. The work was done far faster and at much lower cost than would have been possible

with conventional methods, and scaffolds were eliminated.

The speed, ease and economy of RAMSET SYSTEM "pays off" on almost any kind of anchoring into steel or concrete. Reducing time up to 90% and cutting costs up to 75% are day-by-day experiences of thousands of electrical contractors and maintenance men, many of whom have been profiting from RAMSET SYSTEM for five years or more.

Ask your local dealer for on-your-job demonstration of profit-making RAMSET SYSTEM, or write us for details and new *Specification Manual*.

Ramset Fasteners, Inc. CLEVELAND 11, OHIO
RAMSET DIVISION · OLIN MATHIESON CHEMICAL CORPORATION

FIRST IN POWDER-ACTUATED FASTENING



EDWIN WISMER (right), half of the name-plate on the office of Sacramento contractors Wismer & Becker, checks some practical innovations relating to lift-slab installation. W&B's vice-president, Frank Crum, supplies the answers in this instance.

freezer, dishwasher, food waste disposal unit, automatic washer, dryer and ironer, exhaust fan and intercom connections to numerous remote locations in the home and on the farm generally. Smaller appliances include the "usual" clock, radio, coffee maker, blender and beater, plus the equally-useful assortment of deep fat fryer, knife sharpener, ice cream freezer and food grinder. Atmospheric comfort in the home is provided both by room air-conditioners and by in-built heaters, while electric blankets, TV sets and numerous other electrical devices emphasize all possibilities for brightening 20th-Century living in rural sections of our country.

In other buildings on the farm are a milk cooler, hay dryer and feed mixer (all $7\frac{1}{2}$ -hp units), a 5-hp feed grinder, 3-hp pipe line milker, grain crisper and 4 barn cleaners, a $2\frac{1}{2}$ -hp silo unloader, 1½-hp elevator and ventilation fans, plus 50 additional motor-operated devices of lesser horsepower. The modern shop is comprehensively equipped with an electric bench saw, drill press, table and floor grinders, lathe, overhead hoist, air compressor and 200-amp welder, making it possible for keeping equipment in constant repair and maintenance with negligible delay. In addition, numerous electric heating units (both radiant and infrared) provide warmth for such local areas as the milk house and the brooder pens.

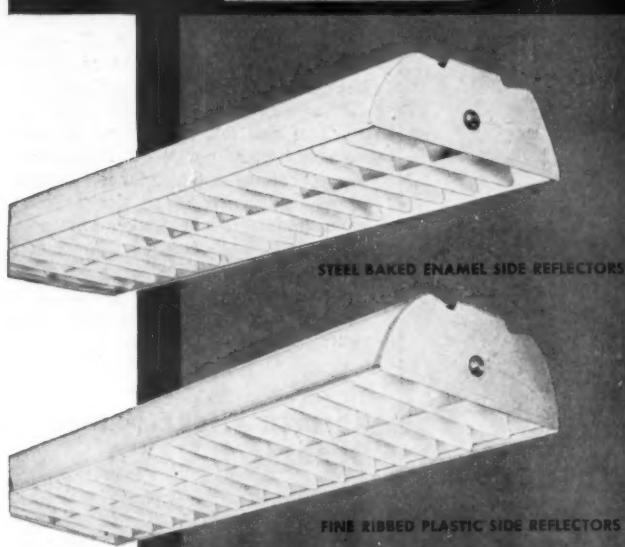
Lighting throughout the Stamy home consistently exceeds IES recommendations, with (1) ceiling fixtures utilizing diffusion mediums of sufficient density to prevent glare from lamps, (2) ceilings painted white to provide maximum reflected illumination, (3) lamps and fixtures arranged to provide even illumination and reduced brightness ratios in all rooms,

NEW CURTIS FORTY-SIXTY SERIES

Shallower . . .
wider . . .
easier to install

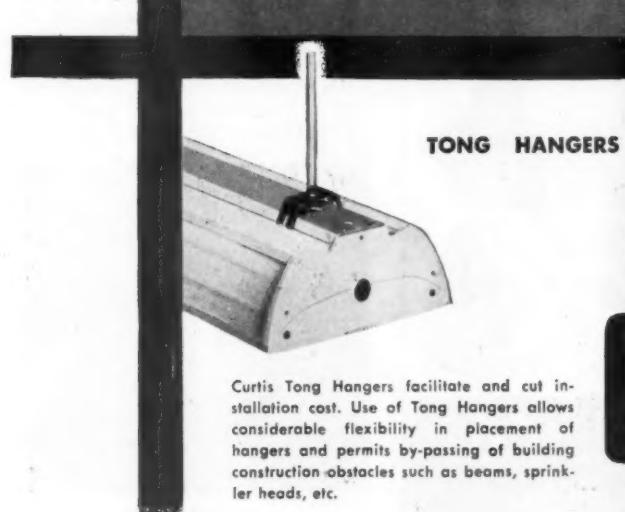


ALZAK ALUMINUM SIDE REFLECTORS



STEEL BAKED ENAMEL SIDE REFLECTORS

FINE RIBBED PLASTIC SIDE REFLECTORS



TONG HANGERS

Curtis Tong Hangers facilitate and cut installation cost. Use of Tong Hangers allows considerable flexibility in placement of hangers and permits by-passing of building construction obstacles such as beams, sprinkler heads, etc.

**NOW AVAILABLE
FOR ALL 4 - 5 AND 8 FOOT
RAPID START, SLIMLINE
STARTER AND LOW BRIGHTNESS LAMPS**

America's most famous line of fluorescent luminaires has been redesigned to give you more than 100 separate and distinct units. The new Curtis Forty-Sixty Series provides excellent general illumination for schools, offices, stores and other commercial interiors. These low-brightness units direct 40% of the light upwards and 60% to the working plane. They also offer a choice of shielding angles for the direct component. Available with Alzak aluminum, steel baked-white enamel and plastic sides. Now, more than ever before, there is a Curtis Forty-Sixty applicable to your next lighting job.

Write for illustrated literature.

NAME _____

ADDRESS _____

CITY _____ STATE _____

CURTIS
LIGHTING, INC.

6135 WEST 65TH STREET
CHICAGO 38, ILLINOIS

QUAD

WHEN
YOU SELL
QUAD
YOU SELL
CUSTOMER
Satisfaction

VAPOR-PROOF REFLECTORS and FIXTURES

There are many locations where moisture and non-combustible dust conditions mean sales for QUAD vapor-proof reflectors and fixtures. The heavy cast hoods are made in vertical, horizontal and outlet box types.

The reflectors are porcelain enameled acid-resisting white inside and green outside. Listed as vapor-tight by Underwriters Laboratories.

The QUAD line of reflectors consists of types for every industrial requirement, both indoor and outdoor. It gives you the opportunity to realize profitable sales. Durability and correct design features each type. Sell QUAD for customer satisfaction.



QUADRANGLE MFG. CO.

325 S. PEORIA ST.

CHICAGO 7, ILL.

(4) 3-way bulbs provided (several being of the 100-200-300-watt size) so that light levels can be selected to suit such varied purposes as casual entertaining, reading or critical-seeing tasks, and (5) 3- and 4-way switches installed so that lights may be turned on or off from any one of several entrances to a room. Fixtures and lamps represent the latest designs in the industry, while special lighting treatments are utilized to illuminate bathroom mirrors, exterior steps, study tables, stairways and various utility areas.

This farm is admittedly a showplace, yet it dramatically emphasizes the fact that farm electrification provides a ready solution to the problem of steadily rising costs. This is verified by records of the owner, who claims that: "During the past 15 years, feed has almost tripled in price and labor has increased nearly four times, although the price we now get for our end product (milk) is just about double what it was in 1938. The only bright spot in this cost picture is that electricity has gone up only 6% during the same period, so we are using as much of this low-cost power as possible to lighten our work load, speed our operations and get more pleasure from farm living. Our electric bills have understandably taken quite a jump—but this increase is repaid many times over by the savings we are realizing through better lighting plus the greatly extended use of power and electric heat."

Norman Wicks Named Manager of NAWB

Norman Wicks was named manager of the National Electrical Manufacturers Association's Business Development Department, succeeding O. C. Small, who is now a consultant to that department. Mr. Small will retire from NEMA service at the end of this year.

Mr. Wicks has been a member of the NEMA staff for the past six years,



NORMAN WICKS

was field representative for the National Adequate Wiring program for two and a half years, and subsequently a recording secretary for several NEMA sections. In addition he was the manager of the Defense Production project from 1950 to 1952, and in this period handled material control problems of NEMA subdivisions. On January 1, 1953, Mr. Wicks was appointed assistant to the managing director, the position he held until this new assignment.

Mr. Small, the retiring manager, is widely known in the electrical industry. He has had almost continuous contact with this country's and Canada's electrical leagues for 32 years, and has carried responsibility for the National Adequate Wiring program since its beginning.

He joined the Society for Electrical Development in 1920, an organization that had been identified with such projects as Wire-Your-Home-Month in 1916, and other early attempts to bring electricity to millions of homes not then electrified. When, in 1923, the SED obtained, from the Electric Service League of Toronto, the right to operate the Red Seal Plan in the United States, Mr. Small carried the responsibility for that operation until the organization was dissolved in 1932.

Mr. Small joined NEMA in 1933 and for the major part of two decades has been responsible for activities designed to expand markets through group action including the development and operation of the National Adequate Wiring Program.

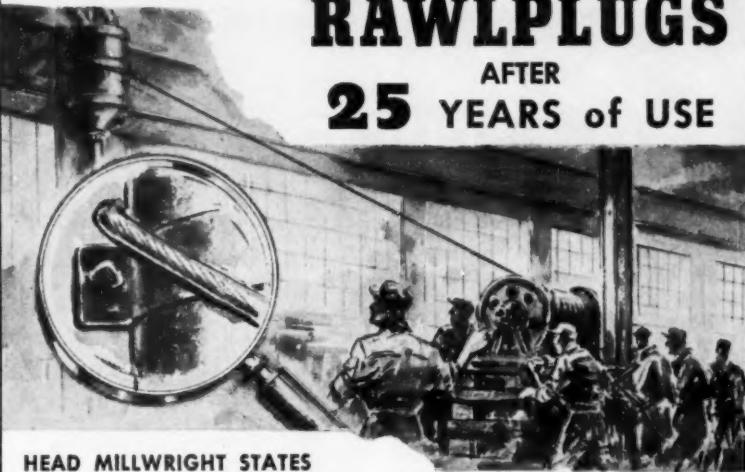
IBEW to Seek Shorter Work Day

Electrical contractors employing IBEW members probably will face demands for a 6-hour day, 30-hour week without reduction of take-home pay when their labor contracts come up for negotiation. That was the goal set at the 25th Convention of the International Brotherhood of Electrical Workers, AFL, held last month at the International Amphitheatre in Chicago. An unemployment-conscious group of 3,250 delegates representing IBEW's 625,000 members approved three resolutions of local unions urging a shorter work day. The International officers and representatives are to "encourage all local unions in negotiations to reduce their hours, but maintain the same take-home pay."

Another action destined to affect job production was a resolution of a Los Angeles Local asking the convention to "go on record as being opposed to the use of powder actuated tools." Delegates approved the resolution sub-

NO OTHER WOOD SCREW ANCHOR HAS EQUALLED THIS PERFORMANCE...

10 TON PULL
NEVER BUDGED
RAWLPLUGS
AFTER
25 YEARS of USE



HEAD MILLWRIGHT STATES

"Rawlplugs have no equal. We have used thousands. This particular dust collector to be torn down was fastened to the wall with $1/4" \times 2"$ band iron, using six $1/2" \times 3"$ lag screws. We put a cable around it, thinking we could pull it from the wall. I am sure we put a ten ton pull on it and never budged it, and had to send a man up on a seat to take the lag screws out and they were as bright as when they were put up 25 years before."

(signed) E. C. Snyder

Head Millwright, Salina, Kansas.

When you require maximum holding power and the least drilling time (you drill smaller holes) use Rawlplugs.

OTHER RAWL PRODUCTS FOR INDUSTRIAL ANCHORING

Write for samples on your letterhead.

- RAWLPLUGS:** Universal screw anchor for any material. The original fibre plug for wood and log screws.
- RAWL-DRIVES:** Drives like a nail into a drilled hole. Holds like a bolt. Use only in hard materials.
- RAWL-TAPERS:** A machine screw anchor that fits the hole drilled either by a new or worn drill.
- RAWL TOGGLE-BOLTS:** For anchoring any fixture or utility in hollow walls or ceilings.
- RAWL CARBIDE DRILLS:** Spiral precision tool for rotary drill or hand brace. Sizes $3/32"$ to $1\frac{1}{2}"$.
- RAWL HAMMER-SETS:** Heavy duty threaded type machine bolt anchor.
- RAWL-ANCHORS:** For holding bolts permanently in materials such as concrete, marble, stone, brick, etc. Heavy duty type.
- RAWLDRILLS:** For drilling holes in all masonry. Easily sharpened. For hand and power drilling.

DIMENSIONAL CHART of above products

THE RAWLPLUG COMPANY, Inc.

271 CHURCH STREET • NEW YORK 13, N. Y.

DARRO DARRO DARRO DARRO

**FOR SOLVING YOUR DRILLING
& ANCHORING PROBLEMS
NOW AND FOR THE FUTURE**

Always Specify ARRO

TRADE **ARRO** MARK



See your industrial, hardware or electrical supplier

ARRO EXPANSION BOLT COMPANY

1540 Boone Ave., Marion, Ohio



IN CHARGE of the motor repair division of Jones Electric Company, Muskegon, Mich., is shop supervisor Clarence Kinsman. An expert electric motor repair specialist, he has some ten men under his direction in a department that has been operating for the past 14 years.

ject to legal opinion of IBEW's general counsel. Prime reason for the proposed ban is the job-site safety of members using the tools which fire stud projectiles into masonry and steel. It was stated that such projectiles often ricochet and wound the operator or surrounding workmen. "The IBEW while not opposing new inventions which tend to speed up work, nevertheless is opposed to going this far in the interest of speed-up," the resolution pointed out.

Approval of these resolutions took place at the last session of the five-day convention. The day before, D. B. Clayton, Sr., president, National Electrical Contractors Association, told the delegates that the high cost of electrical construction is losing jobs for the IBEW electricians and their employers. Clayton cited high wage rates and fringe benefits as establishing employment conditions which are not being accepted by the public and are considered by many as uneconomic for the construction industry. Among these, he listed:

Excessive use of overtime at excessive premium rates.

Unreasonable compensation for travel and subsistence.

Premium compensation for so-called hazardous work.

Unreasonable maintenance requirements for temporary light and power.

Costly vacation plans.

Uneconomic welfare plans.

Unsound ratios of apprentices to journeymen.

Unsound ratios of non-working foremen to journeymen.

Interference with foremen's operations by stewards.

Restrictions on the use of labor saving tools.

Restrictions on the training of apprentices. At the present rate, there

will be one mechanic to replace two retired journeymen 20 years hence.

These fringes increase the cost of each unit of work seriously—in some cases nearly 50%—in the face of steadily reduced costs on kilowatt-hours and many materials, Clayton continued. "Many home owners and small business concerns cannot afford to pay for one hour's work more than they can earn in two to three hours," he warned, adding that in many cases they go out of their way to find someone else to do their electrical work.

Mr. Clayton estimates there is some \$19 billion of electrical modernization work to be done (industrial, commercial, residential, school, etc.) in addition to new construction. Competing for this market will be the IBEW employers, national and area type general contractors, "Do-It-Yourself" addicts, workmen of other unions, and non-union contractors. "To handle this work we must have the properly skilled manpower at costs that the owner can pay. It is the responsibility of our two groups (NECA and IBEW) to see that such services are available to the public," he concluded.

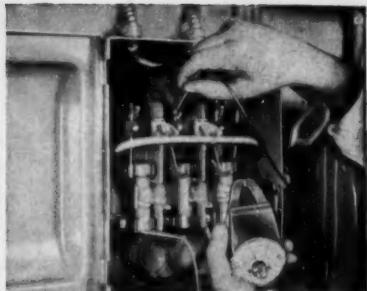
Earlier in the week, delegates voted to return to the incoming executive council and International officers a proposal to increase pension payments 60 cents per month for "A" members working for non-contributing employers. At present, beneficial "A" members pay \$1.60 per month and electrical contractors contribute 1% of their payroll or about \$4.00 per month per "A" member employed by the contractor.



PRACTICING HIS OWN GOSPEL, Joe Lamperdi, owner of the North Bay Electric Works in San Rafael, Calif., is building an extension to his expanding electrical establishment; using radiant heating and exceeding A-W standards in the process. Here he discusses his expansion and modernization plans with well-known west-coast McGraw-Hill-ite Bill Cyr.



"No shutdowns to take current readings"



"A real short cut for checking fuses"



"Takes the guesswork out of servicing"



"Periodic motor checks pay off"



"No longer a problem to balance load"



"I can check appliance current at plug"

save hours this way!

Did you read the comments under the photos? They're typical reports from Amprobe users in the field, telling us how much easier their work has become now that they can measure current and voltage instantly and accurately, with one pocket tool, without having to shut down equipment.

There's an Amprobe for every job, every budget: from 10 amp and 250 volts to 1200 amp and 600 volts AC; from \$19.85 to \$67.50. See them at your jobber's today.

Send for valuable Amprobe service bulletins showing many more ways to save time and eliminate guesswork. Mail coupon now to: PYRAMID INSTRUMENT CORP., LYNBROOK, N. Y. (Export Div.: 458 Broadway, N. Y. 14), world's largest manufacturer of snap-around volt-ammeters.

Amprobe®

snap-around volt-ammeters

Send For Free Service Bulletins:

Pyramid Instrument Corp.
Dept. ECM 104, Lynbrook, N. Y.

Please send me the Amprobe service bulletins checked below:

- How to cut costs and land more jobs
- Trouble-shooting electric motors
- How to boost service profits
- Electrical servicing of hermetic units

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

ROYAL

ENGINEERED FUSES
for dependable
protection

ROYAL-NOARK
NON-RENEWABLE

5
ways better
on the
inside



use them on
EVERY JOB

ROYAL-NOARK
RENEWABLE

easiest
to
renew



Engineering improvements in the design and construction of ROYAL-NOARK cartridge fuses mean that they stay cooler... give greater protection to vital equipment. . . . ask your wholesaler

ROYAL

Quality

WIRE • CARTRIDGE FUSES
Famous ROYAL "Crystal" PLUG FUSES

ROYAL ELECTRIC CO., INC. PAWTUCKET, R. I.



THREE PARTNERS of the Industrial Electric Company in Seattle, Wash., are Howard Bayley, Ralph Lane and Gus Kieburtz, caught in a good mood after performing a present day contracting miracle; that is, taking a bid with a fair profit margin.

Delegates followed the recommendations of the IBEW Law Committee and voted down a proposal to set up an IBEW strike fund to be financed by member assessments and to give legitimate strikers 75% of their weekly wage during a strike. The Law Committee reasoned that strike funds encourage and increase the number of strikes. "How many members would want to work for 25% of their pay when they could get 75% by not working? How could you get a strike settled under such circumstances?" the Committee asked the convention.

During the meeting, J. Scott Milne was elected international president and Joseph D. Keenan, international secretary for four-year terms. National conventions of the IBEW are held every four years.

NISA News

Central District Chapter held its meeting on September 14 in the Tower Club, Chicago. Program consisted of a panel discussion on technical and shop problems and on sales and business administration.

• • • •

NISA Research Division headed by F. W. Willey was authorized by the Board of Directors to write a book "The Story of NISA". With resourceful and energetic Frank Willey as a leader this undertaking is assured of success; however, participation of others is solicited and expected. This will be a very interesting story of continuous growth of NISA and its contribution to industry and fellow members.

• • • •

At the August 10 meeting of the Los Angeles Chapter, the main topic

ROYAL

RIGHT CONTACT
for dependable
wiring devices

CAPS



No. 55

No. 31

CONNECTORS

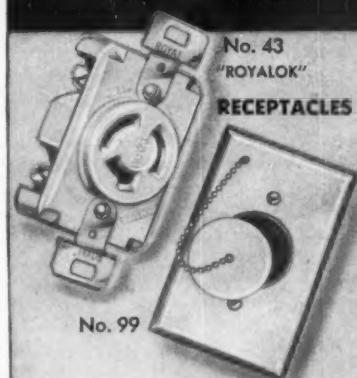


No. 42

use them on
EVERY JOB

No. 43
"ROYALOK"

RECEPTACLES



No. 99

Sound engineering, quality materials, and experienced manufacturing skill make ROYAL wiring devices better for you these three ways: 1) they're easy to wire; 2) always dependable; and 3) long life under constant use.

... ask your wholesaler

ROYAL

Quality

WIRE • CARTRIDGE FUSES
Famous ROYAL "Crystal" PLUG FUSES

ROYAL ELECTRIC CO., INC. PAWTUCKET, R. I.

of discussion was the 1955 convention to be held at the Hotel Statler in June of next year. This will be a big event, and means a lot of work for all between now and then. Just prior to the meeting, various members were chosen to head the committees for the convention. They are William Pompey, Transportation; Earl Sweinhart, Exhibitor's Convention; William Hill, Finance; Russell Lockard, Special Events; Lloyd Mokler, Registration; George Larsen, Program Committee; and Clara Hogue, Ladies' Committee.

William Hogue is Convention Chairman.

Richard Benton gave an interesting talk and presented a movie on Vari-drive U. S. Motors.

• • • • •

New shop buildings are going up in Lubbock, Texas for Lubbock Electric Co. and Brandon & Clark Electric Co.

• • • • •

New Committees for 1954-5 were appointed last month by NISA President G. E. Jones. A total of 22 committees were staffed with three or more members.

• • • • •

Frank T. Foshee, retired president of Foshee Electric Co., Fort Worth, Texas, became NISA's second Privileged Member July 23 when his application was approved by the Membership Committee. Privileged Members are persons no longer actively engaged in the electrical repair business who



BOB CROCKETT (on crutches), electrical foreman for contractors Wismer & Becker, receives some words of wisdom from inspector John Dutton. These two worked together on a recently-completed lift-slab hospital job in Sacramento, Calif. Bob's sprained ankle, incidentally, has no relationship to occupational hazards, although it does emphasize the fact that it is always well to keep your mind on the ground as well as on your work.

COLOR ACCENT LIGHTING

...for rosy Christmas profits!



For a Christmas colored by glowing profit reports, get Amplex Colorbeams . . . the brilliant color floodlamps that put any business in a better light with customers. Available in 14 brilliant colors in a full range of sizes and wattages, business-building Colorbeams actually have a rated average life of 2000 hours! And there's no problem of fading, chipping, or cracking colors . . . because Amplex color is an integral part of the glass. No dwindling light intensity, either, because the sealed-in, pure silver reflector linings guarantee maximum light always.

You'll also stimulate Christmas business with Amplex Swivelites, unapproached for accent lighting. All Swivelites are finger-tip controlled, all offer deluxe satin aluminum finish, and all basic units are interchangeable. Accent lighting that accents profits!

These are but two great products in the unsurpassed Amplex line . . . a line designed to meet your every lighting need and light the way to more business. For information write:

**amplex Corporation, Dept. ECM-10,
111 Water Street, Brooklyn 1, N. Y.**



R-40
for indoor use



PAR-38
for outdoor-
indoor use



R-30
for indoor use



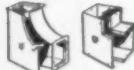
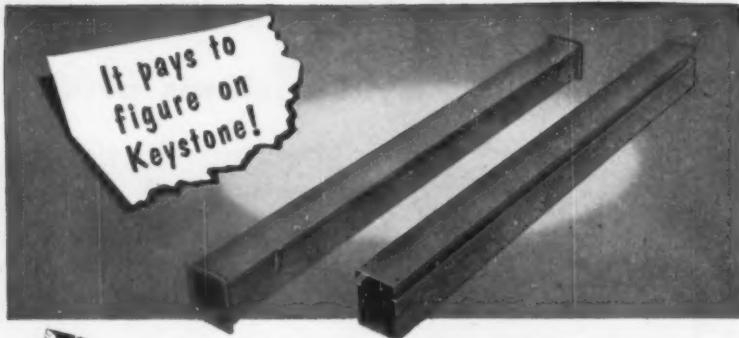
C-11-SH
for indoor use



IT'S MORE THAN AMPLE

...IT'S

amplex



KEYSTONE WIREWAYS AND AUXILIARY FITTINGS ARE QUALITY BUILT FOR QUICK INSTALLATION!

Next time you're figuring a wiring installation job, you'll find it pays to specify Keystone Wireways and Auxiliary Fittings. They're quality built from end to end...designed to permit quick, easy, economical installation of wiring for main power lines, feeders, branch circuits, meter boards, service boards, loadside switches, etc. And they're available in both flanged and flangeless styles in the most complete range of sizes and lengths...2½" x 2½" x 1' through 8" x 8" x 5'...to meet your exact requirements.

FREE CATALOG describes and illustrates the entire line of Keystone Wireways and Fittings, Cutout Boxes, Pull Boxes, Outlet Boxes, Switch Boxes, Covers, and Bar Hangers. Contains complete specifications and prices. Send for your free copy today!

KEYSTONE MANUFACTURING COMPANY
23328 SHERWOOD AVENUE
CENTER LINE (Detroit), MICHIGAN



Sold Through Leading Electrical Distributors Coast-to-Coast



Everybody's happier with MASTER-TENNA* by RCA!

YOUR CUSTOMERS

Avoid the unsightly cluster of TV antennas atop their property. One MASTER-TENNA serves an entire building. Tenants are assured of the clearest, sharpest picture from any VHF or UHF station—in black and white or color! And property owners gain an added source of revenue.



YOU

can recommend MASTER-TENNA by RCA with full confidence that your customers are receiving an antenna system developed by the most famous name in electronics.

RCA Service Company branches everywhere are prepared to handle your MASTER-TENNA system estimates, equipment needs, and to provide complete MASTER-TENNA system installation and maintenance.

*MASTER-TENNA®

— MAIL COUPON TODAY FOR FULL INFORMATION! —

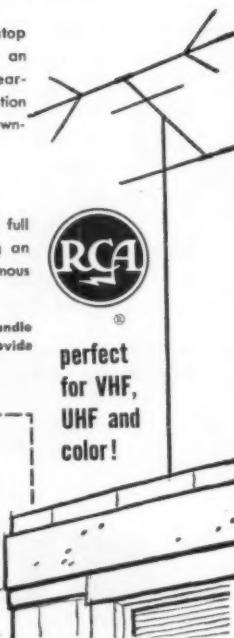
Master-Tenna Sales
RCA Service Company, Inc.
Camden, New Jersey

Please send full details on the MASTER-TENNA system by RCA.

NAME _____

ADDRESS _____

CITY _____ STATE _____



SALES MINDED shop superintendent Melvin DeYoung has full charge of all motor service work at Whittaker Electric Company in Muskegon, Mich. One of his ideas—summer rental of fans to industrial and commercial customers is taking hold; another—vapor degreasing of stator coils prevents burning out shellac between laminations normally incurred when incineration is used.

have represented firms that were NISA members at least 10 years.

Foshee, a NISA director during the period 1943-49 and a former director and organizer of Southwestern Chapter, is now a representative of W. M. Smith Co., Dallas, recently appointed agents in a five-state area for Belgian Sales Corp. Foshee holds a patent on a device to prevent three-phase motors from single-phasing when one fuse blows out. He entered the electrical business in 1917 with Shreveport Armature Works, Shreveport, La., later working for firms in Los Angeles and Dallas. He started his own business in Fort Worth in 1932, selling out last year. He resides at 725 Garden Oaks Blvd., Houston, Texas.

• • • • •
Electric Motor Service Association of the District of Columbia elected new officers at its annual meeting held in July. President is E. W. Bishop, Potomac Armature Service; secretary, Walter Bailey, Central Armature Works, Inc.; treasurer, W. E. Peters, National Electric Machine Shops, Inc.; and recording secretary, John W. Lainhart, Warfield & Sanford, Inc. The chapter held its annual summer outing and fishing trip at Selby-on-the-Bay, Maryland, September 11.

• • • • •
The meeting date for the coming meeting of Southwestern Chapter has been changed to October 22-23, Wooten Hotel, Abilene, Texas, to avoid conflicting with the Tampa meeting of Southeastern Chapter, Oct. 8-9. J. C. Hardie, Industrial Electric

Equipment Co., Dallas; NISA President G. E. Jones, G. E. Jones Electric Co., Amarillo, Texas; Paul V. Bush, Lubbock Electric Co., Lubbock, Texas; George Foshee, Foshee Electric Co., Fort Worth; and chapter recording secretary Ann Hickman met July 31 in Abilene to plan the meeting where more than 100 members, wives and guests are expected.

• • • • •
Great Lakes Chapter held its 1954 outing September 11 at the Whitmore Lake cottage of Charles J. Cannon, Nimmo Electric Co., Detroit. The meeting was an all-day affair with swimming, boating, games and refreshments.

• • • • •
North Central and Midwestern Chapters held a joint meeting September 17-18 at Vacation Village on West Okoboji Lake, 20 miles north of Spencer, Iowa.

• • • • •
Greater St. Louis Chapter met August 25 at Lemmon's Restaurant in South St. Louis for dinner. Officers were elected, as follows: President, R. A. Guehne, National Electric Service, St. Louis; vice-president, George Wester, Wester Electric Co., St. Louis; secretary-treasurer, E. F. Niebruegge, Hopcroft Electric Co. Inc., Edwardsville, Ill.

• • • • •
NISA Secretary Charles J. Covington, Dowzer Electric Machinery Works, Mt. Vernon, Ill., currently is investigating costs and methods of microfilming minutes of the Association's Board of Directors meetings and some National Headquarters files

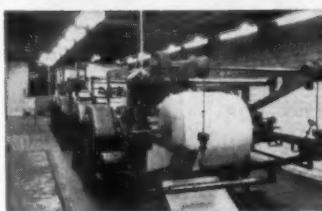


CHIEF ENGINEER Hugh Whisler controls the operation of the Carborundum Company's plant in Vancouver, Wash., where an extensive modernization and expansion program has been furthered through the recent efforts of such electrical contracting outfits as Fischbach-Moore, Lord, and Jagger-Sroufe.

ONE SOURCE FOR EVERY LIGHTING NEED!

PITTSBURGH PERMAFLECTOR FLUORESCENT AND INCANDESCENT LIGHTING EQUIPMENT

In office or plant, drafting or classroom, storeroom or boardroom—Pittsburgh Permaflector Lighting Equipment assures you the light you need where it's needed. Standard incandescent and fluorescent units, or combinations of both, for commercial, institutional and industrial lighting.



INCANDESCENT & FLUORESCENT COMMERCIAL UNITS

- | | |
|---|---|
| <input type="checkbox"/> Ceiling Recessed | <input type="checkbox"/> Selling Floors |
| <input type="checkbox"/> Show Window | <input type="checkbox"/> Offices |
| <input type="checkbox"/> Display & Spot | <input type="checkbox"/> Lobbies |
| <input type="checkbox"/> Marquees | <input type="checkbox"/> Storerooms |

INCANDESCENT & FLUORESCENT INDUSTRIAL UNITS

- | | |
|---|--|
| <input type="checkbox"/> Work Areas | <input type="checkbox"/> Storage |
| <input type="checkbox"/> Drafting Rooms | <input type="checkbox"/> Offices |
| <input type="checkbox"/> High Bay Areas | <input type="checkbox"/> Low Bay Areas |
| <input type="checkbox"/> Exterior Flood | <input type="checkbox"/> Work Yard |

INCANDESCENT & FLUORESCENT INSTITUTIONAL UNITS

- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> Gymnasiums | <input type="checkbox"/> Auditoriums |
| <input type="checkbox"/> Classrooms | <input type="checkbox"/> Laboratories |
| <input type="checkbox"/> Churches | <input type="checkbox"/> Hospitals |
| <input type="checkbox"/> Hotels | <input type="checkbox"/> Museums |

INCANDESCENT & FLUORESCENT MISCELLANEOUS UNITS

- | | |
|---|-----------------------------------|
| <input type="checkbox"/> Athletic Fields | <input type="checkbox"/> Foyers |
| <input type="checkbox"/> Airports | <input type="checkbox"/> Hangers |
| <input type="checkbox"/> Exhibition Halls | <input type="checkbox"/> Armories |

WRITE FOR BULLETINS
Check applications, clip and mail for data.

PITTSBURGH REFLECTOR COMPANY

404 OLIVER BUILDING, PITTSBURGH 22, PA.

FLUORESCENT



INCANDESCENT

Lighting

REPRESENTATIVES IN PRINCIPAL CITIES • WHOLESALERS EVERYWHERE

COOLER LIGHTING CLEANER LIGHTING LONGER LAMP LIFE



This original ABOLITE idea starts automatic air circulation around the lamp and thru the ventilator slots of the ABOLITE reflector thus keeping lamp and reflector surfaces cleaner, longer. Lamp necks stay cooler to provide maximum lamp life.

ABOLITE is your *first choice* in lighting reflectors. First with new ideas — ventilator slots, all-white porcelain finish. First with practical features for easy installation — outlet box reflectors. First with the new designs for new type lamps—the Protecto-Shield for R-52 and R-57 lamps. There's an ABOLITE for every lighting requirement.

WHITER
THAN
WHITE

ABOLITE
Lighting

THE JONES METAL PRODUCTS CO. • West Lafayette, Ohio

OTHER FIRSTS FROM ABOLITE



**OUTLET BOX
REFLECTOR**
Available in both RLM and
Shallow Dome designs.



JIFFY-LITE
No more unsafe "naked
bulbs." Two piece socket
and reflector form single
lighting unit that screws
into any socket. No tools
needed. Low priced.



FLOOD LIGHTS
A complete line for every
application from parking
lots, and railroad yards to
sign lighting or sport fields.

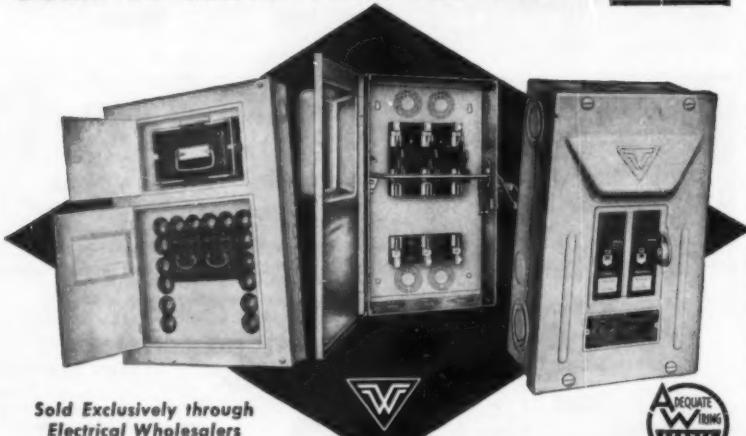


RADIANT HEATING is the full-time concern of Marshall Johnson, who designs, specifies and supervises heating installations for customers of the North Bay Electric Works of San Rafael, Calif. Using all available heating mediums to provide specific heating characteristics and capacities, he intelligently combines panels, coils, cables and glass, to obtain an exact predicted result.

and records prior to reporting to the Board of Directors at its mid-year meeting in Fort Wayne, Ind., December 5. Plans call for permanent storage of one set of film and a second set to be made available for reference.

From Walter J. Prise, Queens Electric Motors, Inc., Jamaica, L. I., N. Y.

**WADSWORTH
PRODUCTS!**
BUILT TO SERVE YOUR CUSTOMERS **BETTER**



Sold Exclusively through
Electrical Wholesalers

WRITE
FOR
FREE
CATALOG

The WADSWORTH ELECTRIC MFG CO. INC.
Corington, Kentucky



Provisions of this amendment are as follows:

Interim Amendment No. 101
National Electrical Code, 1953 Edition
Effective January 1, 1955

In Article 422, following Section 4286, add a center caption and new Sections 4291, 4292 and 4293 to read as follows:

Provisions For Air-Conditioning Units

4291. General. The provisions of this section shall apply to electrically energized units and equipment which control temperature and humidity.

4292. Grounding. Exposed non-current-carrying metal parts which are liable to become energized shall be grounded under one or more of the following conditions:

1. if permanently connected to metal-clad wiring;
2. if in a wet location and not isolated;
3. if within reach of a person standing on the ground outside of a building;
4. if in a hazardous location, see Article 500;
5. if in electrical contact with metal or metal lath;
6. if more than 150 volts to ground.

4293. Branch Circuit Requirements.

1. The total load of motor operated air-conditioning equipment shall not exceed 80 per cent of the rating of a branch circuit which does not supply lighting units or other appliances;
2. The total load of air-conditioning equipment shall not exceed 50 per cent of the rating of a branch circuit if lighting units or other appliances are also supplied.

This interim amendment is to be included in the 1954 printing of the 1953 National Electrical Code incorporated in Vol. V of the National Fire Codes published in September 1954 by the National Fire Protection Association, 60 Batterymarch Street, Boston.

Residential Wiring Handbook

The first new Residential Wiring Handbook since 1946 was to be ready for distribution about October 1, according to the Edison Electric Institute, which was authorized by the Industry Committee on Interior Wiring Design to publish the 32-page manual.



SPECIALIZING in silicone insulated windings keeps Clarence Phillips, owner of Phillips Electric Motor Service busy with Class H rewinds for the chemical and petroleum industries in the Long Beach, Cal. area. Routine is to finish Class H jobs outside with Dow Corning bright yellow silicone enamel for quick identification. Special metal tag attached to each motor serviced shows date work was done. Motors not rewound with Class H are returned to owner finished red.

Cuts Metal 15 Times Faster

than

Hand Hack Saw!



Only

NEW ... Porter-Cable
Portable Band Saw **\$215.00**

Slices through 1½" cold rolled steel in 41 seconds! That's fifteen times faster than a good man with a hack saw . . . *two-and-a-half times faster* than bulky power hack saws!

You can use this 16-pound work-demon anywhere—on ferrous or non-ferrous metals or "problem" materials. Take it into equipment yards, stock bins . . . tight spots where costly hand sawing is the only other answer. Use it for general maintenance, teardowns. Compact, easy to handle, Porta-Band delivers smooth controlled sawing in any position. Only the cutting part of the blade is exposed. Cutting

action pulls the blade snugly into cut, holding saw firmly in place.

Powered for heavy duty . . . perfectly balanced . . . Porta-Band handles the toughest assignments. Band speed of 240 feet per minute insures swift, smooth cutting of all materials up to 3¼" diameter round, or 3¼" x 4¼" rectangular. Highest grade precision ball and needle bearing throughout. Aluminum alloy frame for lightness, toughness. Universal 115V AC-DC, 25-60 cycle motor (230V available at extra cost).

Porter-Cable

Quality Electric Tools

PORTER-CABLE MACHINE CO.

2090 N. Salina St., Syracuse 8, N. Y.

(In Canada, send to: Strongbridge, Ltd., London, Ont.)
Send full information on Porta-Band and name of nearest dealer.

Name _____

Company _____

Type of Business _____

Street _____

City _____ County _____ State _____

Manufacturers of Speedmatic and Guild Electric Tools

MAIL
COUPON
FOR
FREE
DETAILS

two engineers can be
better than one

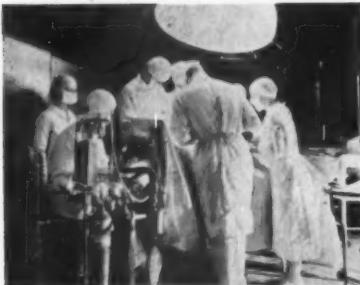


Working together, your plant engineer and STANDARD'S engineer-representative in your area can properly evaluate your transformer requirements. There's no need to adjust your plans to stock models when you buy STANDARD. You get the exact transformer, designed for your particular job.

Standard
THE STANDARD TRANSFORMER COMPANY

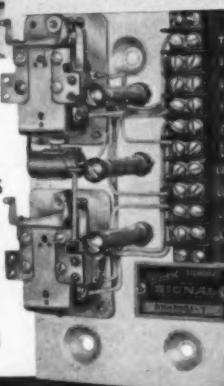
WARREN, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES

Safeguard against shock and Spark Hazards



Recommended
SAFE PRACTICE
OF THE
National Board of Fire Underwriters
FOR
HOSPITAL OPERATING
ROOMS
AS RECOMMENDED BY THE
NATIONAL FIRE PROTECTION ASSOCIATION

**GROUND
DETECTOR
RELAY**
FOR UNGROUNDED EQUIPMENT
IN HOSPITAL OPERATING ROOMS



ENGINEERING
REPRESENTATIVES IN
PRINCIPAL CITIES.

Whealock
RELAYS
SIGNAL
ENGINEERING & MFG. CO.
LONG BRANCH, NEW JERSEY



OPEN OVEN used for baking small jobs in the motor repair shop of Kistler Electric Co., Colorado Springs, Colorado, consists of two infrared lamps mounted as shown. Each lamp socket is installed in the center of a metal reflector and each assembly of lamp and reflector is swivel mounted on a short stand. A control for adjusting heat output is shown at right. K. T. Kistler is shown with his hand on the control.

As set forth in this completely revised edition, standards for home wiring systems are brought into line with current and anticipated future usage of electricity in the average home. Also, for the first time, the standards it sets forth carry the endorsement of a group of the nation's biggest builders, as represented by the National Association of Home Builders.

One of the significant changes recognized by the standards is that from the two-story to the one-floor plan, a development which has become an accepted "trademark" of the contemporary house.

Explanatory material has been considerably expanded to include some discussion of the growth of the use of electricity, and to draw into the purview of the publication lending institutions, architects and engineers, as well as builders, electrical contractors, new home buyers, and those engaged in modernizing older homes.

Organizations represented in developing standards for wiring applicable to today are the American Home Lighting Institute, Edison Electric Institute, International Association of Electrical Inspectors, National Association of Home Builders, National Association of Electrical Distributors, National Electrical Contractors Association, National Electrical Manufacturers Association, Radio, Electronics and Television Manufacturers Association. Endorsing organizations are the American Institute of Electrical Engineers, American Society of Agricultural Engineers, Illuminating Engineering Society.

Book Reviews

Lighting for Color and Form

Lighting application becomes more difficult, and at the same time more interesting, as the science of lighting expands in scope. Thus today's lighting engineer faces a real challenge as well as an opportunity.

The challenge is to design better lighting systems with proper quantity and quality of illumination which combine with interior treatments to provide ideal luminous environments. The opportunity is to thereby make people happier and more cheerful and comfortable, both scientifically and psychologically.

How to achieve these objectives has been clearly outlined in a new 340-page book titled "Lighting for Color and Form". This book has been authored by Rollo Gillespie Williams, international authority on color lighting with thousands of successful installations to his credit. It combines in one handy reference a broad scope of different but related subjects dealing with the entire range of psychological and scientific factors involved in success-



SPECIAL REWOUND motors being tested by A. C. Line, owner of Electric Motor Repair Co., Los Angeles, are 50 hp in 3 hp standard U. S. frames, for special aircraft application. New rating is 6 pole, 208 volts, 400 cycles, 7925 rpm, rewound to close tolerance with No. 13 silicone insulated wire, immersed three times in No. 997 Dow Corning silicone varnish, and baked 40 hours at 175° to 450° F. A. C. Line has been in the motor repair business 22 years, does industrial work, with lots of aircraft and special test work for the aircraft and electronic industries concentrated in his area.

A Borthig Extra . . .

HIGH-FLASH



*Tag closed A.S.T.M. Tester

Here is a Borthig Extra for those shops that require a fine quality Baking Varnish with a High Flash Point.

Made especially for these shops—Borthig K-252-HF* can now be obtained with a high flash solvent (100° F Closed Cap). All the fine properties and stability of Borthig standard K-252 are retained to make K-252-HF an outstanding Baking Varnish with High Flash characteristics.

Write today for information and samples.



GEORGE C. BORTHIG CO., INC.
Insulating Varnishes

EAST RUTHERFORD, N. J., DEPT. A • P. O. BOX 115



Why Pay FOR STARTER CAPACITY NEVER USED?

THE ANSWER TO THIS QUESTION COULD SAVE hard-earned dollars needlessly thrown away.

When choosing from the widest range of starters in the 1-50 hp range, you save by selecting the starter matched to the job—with no wasted capacity.

Furnas Electric starters—nine of them in the 1-50 hp range—are designed and built to match most applications.

**Save 25% TODAY
LIKE THIS**

Here's an example of typical savings you can earn through proper starter selection: for 10 hp service, for example, you'd select Furnas Electric Type YE rated for the job. This saves you up to 25% on initial costs and 40% on space over a YF size 2 (rated 25 hp) normally selected for 10 hp service.

All of the nine Furnas Electric sizes offer worthwhile savings.

Important FEATURES

Furnas Electric starters give you these additional benefits. *Dual Voltage Coils*—matched to motor voltage. *Thermal Overload Protection*. *Shallow Case* for easy wiring. *Durability* to stand up under rough service. *Arc Resistant Terminal Board*. *Arc Quenching Silver Contacts*.

Complete RANGE OF OTHER PRODUCTS

Pressure switches for air and water applications. Drum controllers for reversing, multi-speed and reversing multi-speed service.

Write today for full story or contact our representative near you. Furnas Electric Co., 1067 McKee St., Batavia, Illinois.



ful lighting application. It has new information on color as it relates to lighting, and fresh viewpoints on light and color as an indispensable tool for the lighting artist, be he an architect, decorator, lighting engineer, display expert, or electrical engineer or contractor.

The book is divided into four parts for logical presentation of subject coverage. Part I is devoted to "Light, Color Perception and Rendition," and explains the fundamentals of light and color and their relationship in a simple manner. Part II discusses the "Production and Control of Colored and Directional Lighting", and presents the important characteristics of light sources and filters, and of lighting equipment for color, accent and modelling. Part III is a practical discussion of "Psychological and Aesthetic Factors" of color in lighting, including directional light, shade, and color, color harmony, contrast, and discord. Part IV presents "Lighting Application Techniques", and includes chapters on display, architectural, stage, and special lighting effects.

Lighting for Color and Form contains 18 chapters, has 138 illustrations and three color plates. It is 6"x9" in size, and is published by Pitman Publishing Corporation, 2 West 45th Street, New York 56, New York. Price is \$8.50.



ONE MAN GANG for quick and efficient materials handling at Dahl-Beck Electric Company, San Francisco, consists of a single operator and two three-ton, close headroom electric hoists. As motors and other loads, ranging from pounds to tons in weight, come into the shop for repair they are picked up directly from delivery trucks and carried anywhere in the shop. At any time, for any job, one man can handle the whole operation.



THIEL **Easy-Drive
STAPLES**
(Pat. #2632356)
Engineered to take punishment
• **WON'T BEND OR SQUASH**
• **WON'T SPLIT HARDEST WOOD**

Contractors want these strong, rugged flat-top THIEL Staples because they save worry and waste in time and material—they don't have to "babysit" them. THIEL Easy-Drive-Staples go in straight and true and are the greatest improvement in staples for cable work, metallic and non-metallic, in 25 years. Send for FREE samples—a trial will convince anyone.

THIEL EASY-DRIVE "NAIL IT" and THIEL "EASY-ON" STRAPS are another must for electrical men.

• Sold by Leading Electrical Wholesalers—
write for information on open territories.

THIEL **TOOL AND
ENGINEERING
COMPANY**
1417 North Market Street, St. Louis 6, Missouri

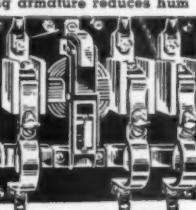


ZENITH
HEAVY DUTY MAGNETIC CONTACTORS

For Sign Flashers, Bombarders,
Time Switches — many uses.

Built for continuous flashing duty. Will not overheat on 24-hour service. Most silent A.C. contactor made. Full-floating armature reduces hum to minimum. Operates up to 60 times per minute at 80% of rating. All parts quickly accessible. Available in 30-300 amp. A.C., 1, 2, 3 poles, or 30-200 amp. D.C., 1, 2 poles. Send for catalog and low prices.

Call your sign jobber
for contactors from
stock.



See classified telephone directory for name
of local distributor.

ZENITH ELECTRIC CO.

155 W. Walton St., Chicago 10, Ill.

DATES AHEAD

International Association of Electrical Inspectors—Western Section, Louisville, Ky., October 11-13; Southern Section, Tampa Terrace Hotel, Tampa, Fla., October 25-27.

American Institute of Electrical Engineers—Fall general meeting, Morrison Hotel, Chicago, Ill., October 11-15.

New Jersey Council of Electrical Leagues—18th annual convention, Hotel Ambassador, Atlantic City, N. J., October 15-16.

National Safety Congress and Exposition—Conrad Hilton Hotel, Chicago, Ill., October 18-22.

National Electrical Contractors Association—Annual convention, Jung Hotel, New Orleans, La., October 27-30.

National Electrical Manufacturers Assn.—Haddon Hall Hotel, Atlantic City, N. J., November 8-11.

National Farm Electrification Conference—Van Curler Hotel, Schenectady, N. Y., November 18-19.

Plant Maintenance & Engineering Show—International Amphitheatre, Chicago, Ill., January 24-27.

International Heating and Ventilating Exposition—Commercial Museum and Convention Hall, Philadelphia, Pa., January 24-28.

American Institute of Electrical Engineers—Winter general meeting, Hotel Statler, New York, N. Y., January 31-February 4.

National Rural Electric Cooperative Assn.—Annual meeting, Atlantic City, N. J., February 14-17.

National Electrical Manufacturers Assn.—Edgewater Beach Hotel, Chicago, Ill., March 13-18.

Chicago Electrical Industry Show—Third biennial exhibit sponsored by the Electric Association of Chicago in cooperation with the Electrical Maintenance Engineers of Chicago, Conrad Hilton Hotel, Chicago, Ill., May 10-12.

National Fire Protection Assn.—59th annual convention, Netherland Plaza Hotel, Cincinnati, Ohio, May 16-20.

National Industrial Service Assn., Inc.—Annual convention, Hotel Statler, Los Angeles, Calif., June 5-9.

Illuminating Engineering Society—National Technical Conference, Statler Hotel, Cleveland, Ohio, September 12-16.



NECA MANAGER for the Portland, Ore., Chapter, Larry Rodgers, confidently predicts a 3- or 4-year boom for northwest electrical contractors. Harry Gollinger, northwest district manager for Lord Electric, thoroughly appreciates the prediction and hopes there will be enough work to keep everybody busy, happy—and well fed.



MODERNIZE
YOUR
WARNING
SIGNAL SYSTEM

with this
NEW extra-compact powerful

BENJAMIN SIREN!

This new siren is especially designed for modern multiple-signal installations, which overcome problems of atmospheric conditions, wind direction and industrial din. A small yet-powerful high-torque, 10,000 r.p.m. motor and precision-machined housing makes possible extra-compact design. Famous Benjamin built-like-a-battleship construction prevents moisture from entering and assures long, trouble-free operation.

It's the
**20th Century Pony,
Express!**

FREE SIGNAL BOOK! Send for your copy of this most complete book on signaling! Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Ill.

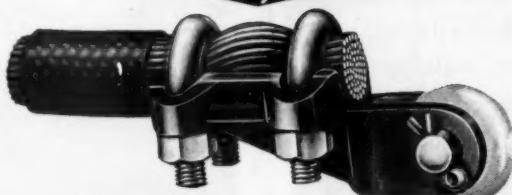
FREE

*Send for yours
Today!*

LOCK CABLE SAFELY, SECURELY with—

"EFFICIENCY" Cable Strain Clamps

without Strain or Damage



... withstands direct pull of 17,000 pounds

Efficiency Cable Strain Clamps lock cable safely and securely without possible strain or damage. "H" construction of clamps and high ridge across center of cable prevents cable from slipping. Takes cable from 1/0 to 1,500-000 c. m. Three clamp sizes cover all cable sizes. Furnished with eye or clevis, for AC or DC service.

Write for Catalog 38-A

Efficiency

ELECTRIC AND MANUFACTURING CO.

EAST PALESTINE, OHIO

"EFFICIENCY" DEVICES FOR CONDUIT and CABLE SUSPENSION

On Again...Off Again
Ground Lamps
Indicating Trouble?



Eliminate grounds and short circuits by installing Adalet insulating bushings on every conduit terminal. Underwriters Laboratories approved, strong but resilient, they are used extensively by steel mills, chemical plants, etc. to assure:

- 1—Trouble-free wiring
- 2—Adequate protection
- 3—Minimum maintenance

S A L I insulating bushings are available for rigid or thin-wall conduit, threaded or threadless. Male or female types or precision molded bushings are also available.

Request Bulletin A
or ask for complete
Adalet Catalog.

**THE ADALET
MANUFACTURING CO.**
CLEVELAND 11, OHIO

Among the Manufacturers

Headquarters Announcements

Benjamin Electric Mfg. Co., Des Plaines, Ill.—Hoyt P. Steele, president; C. F. W. Alfvén, vice president; J. H. Fall III, vice president and general sales manager.

General Electric Co., Schenectady, N. Y.—C. T. Kastner and J. Benning Monk, sales managers, Transformer Dept.

Diamond Expansion Bolt Co., Inc., Garwood, N. J.—Charles W. Fuhrer, assistant sales manager.

Pennsylvania Flexible Metallic Tubing Co., Philadelphia, Pa.—Sidney S. Blake, director.

Minnesota Mining & Mfg. Co., Irvington Varnish & Insulator Div., Irvington, N. J.—Paul L. Hedrick, technical service manager.

Eutectic Welding Alloys Corp., Flushing, N. Y.—J. P. Coughlin, assistant to the president.

General Electric Co., Syracuse, N. Y.—Walter E. Sutter, sales manager for instruments and industrial electronic products.

Kaiser Aluminum & Chemical Sales, Inc., Philadelphia, Pa.—J. P. Moran, sales manager, aluminum building wire.

Minneapolis - Honeywell Regulator Co., Minneapolis, Minn.—C. W. Bowden, Jr., market extension manager, Industrial Div.

Gothard Mfg. Co., Springfield, Ill.—William A. Gothard, president and general manager.

Unistrut Products Co., Chicago, Ill.—G. W. Butler, executive vice president; J. P. Heslin, sales, and A. J.



HIXON ELECTRIC foreman, Len White, and Bob Schofield, field engineer for Fuller Construction, worked together as a team on the revolutionary spherical auditorium at Cambridge, Massachusetts, being erected for M.I.T.

MINERALLAC BEAM CLAMPS

FOR
MOUNTING
HANGERS
ON I-BEAMS



Mounts Minerallac hangers No. 8 to No. 6 on I-beams safely without necessity of drilling holes. Made of heavy gauge zinc plated steel with deep drawn ribs to give needed strength, these durable, light weight beam clamps have 14-20 tapped holes—will fit beam flanges up to 1/2 inch thick. Furnished with case-hardened set screw. Low cost.

Order From Your Electrical Wholesaler
SEND FOR LITERATURE

MINERALLAC ELECTRIC COMPANY
25 North Peoria St. Chicago 7, Ill.

MINERALLAC

NEW PRECISION DYNAMOMETER



For determining the force required to actuate delicate mechanisms.



Here is a new instrument that has quickly become an indispensable aid to measure, calibrate and standardize the pressure or power required to actuate fine precision mechanisms and spring tensions of ELECTRIC CONTACTS - RELAYS - CLOCKS - TELEPHONES - BUSINESS MACHINES - MICRO MOTORS for Electric Razors - WINDSHIELD WIPERS - TIME SWITCHES - ETC. . .

THE DYNAMOMETER IS AVAILABLE IN 2 SIZES WITH OPERATING PRESSURES RANGING FROM 5-15 GRAMS TO 100-1000 GRAMS.

WRITE FOR ILLUSTRATED FOLDER

GEORGE SCHERR CO., Inc.
100-EC LAFAYETTE ST. • NEW YORK 12, N.Y.



GEORGE CURRAN, general electrical foreman for Sacramento contractors Wismer & Becker, was in charge of the electrical installation in Campbell Soup's greatly-expanded up-to-the-minute West Coast processing plant.

Croze, engineering, both vice presidents.

Sylvania Electric Products Inc., Wheeling, W. Va.—Thomas G. Hearn, sales manager of fluorescent fixtures.

Cutler Electrical Products, Inc., Philadelphia, Pa.—Hans K. Rosenthal, sales manager for cold cathode lighting.

G & W Electric Specialty Co., Chicago, Ill.—C. W. Sward, vice president; L. J. Dylewski, sales manager; W. F. Young, assistant vice president.

Hubbard and Co., Pittsburgh, Pa.—Howard Jackson, Charles S. Kernaghan, and Richard G. Robbins, vice presidents.

Regional Appointments

NEW ENGLAND

Electric Regulator Corp.: R. L. de Veer, sales representative.

Transcoil Corp.: Tom Blackburne, engineering sales representative.

Minneapolis - Honeywell Regulator Co.: R. W. Forster, Boston sales manager.

MIDDLE ATLANTIC

Prescolite Mfg. Corp.: Austin Little, executive director of the company's eastern operations, working out of Neshaminy, Pa., plant.

Sterling Electric Motors, Inc.: Richard J. Zobel, Philadelphia, Pa., district manager.

General Electric Co.: James R. Bosone, representative of the Construction Materials Division in Philadelphia, Pa.

Graybar Electric Co.: H. D. Epps, district operating manager for Pittsburgh, Pa.

Sylvania Electric Products Inc.: Charles I. Brady, sales manager for

CUSTOM-BUILT

INSTRUMENT PANELS

CONTROL PANELS

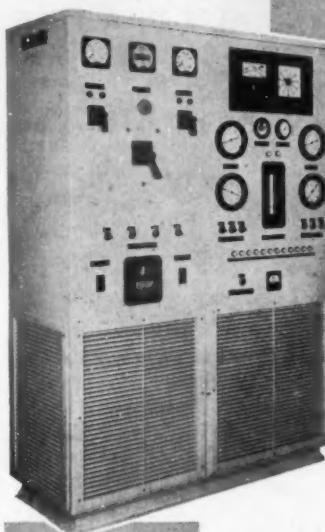
CUBICLES

Let us quote on your requirements

Nelson Electric Mfg. Company has specialized in developing the skills that are required for producing instrument and control panels that meet, in every detail, the specifications of each customer.

We render a complete engineering service if desired. We do all fabricating and assembling, all wiring, all piping and all testing. Bare panels, without instruments, can also be furnished.

Write for a copy of our new "Pictorial Index".



NELSON *Electric* **MANUFACTURING CO.**

TULSA, OKLAHOMA

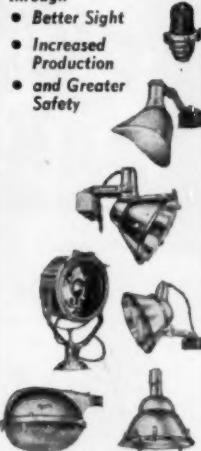
217 N. DETROIT AVE.

TELEPHONE 2-5131



A *Revere* INSTALLATION PAYS DIVIDENDS

- through
- Better Sight
- Increased Production
- and Greater Safety



EVERY Plant can use obstruction Lights for Stacks and Towers, Searchlights for fences, Mercury-Vapor Units for yard and road lighting, High, Medium or Low Bay Reflectors, Area Lighters, etc.

Revere *Electric Mfg. Co.* **LIGHTING - Excel!**

REVERE ELECTRIC MANUFACTURING CO. • 6017 BROADWAY • CHICAGO 40, ILL.

Available in Canada thru Curtis Lighting, Ltd., Leaside, Toronto

THE COMPLETE LINE OF FLOODLIGHTS AND POLES FOR SERVICE STATION - SPORTS - AIRPORT - STREET - OUTDOOR THEATRE - MARINE AND INDUSTRIAL LIGHTING



•
WE
SHIP
FROM
STOCK
•

POWERCRAFT PRIMARY BUS SUPPORTS

These Bus Supports conform to NEMA standards and have been used by many Contractors, Industrials, and Utilities. Available for Indoor and Outdoor service—pipe or flat mounting.

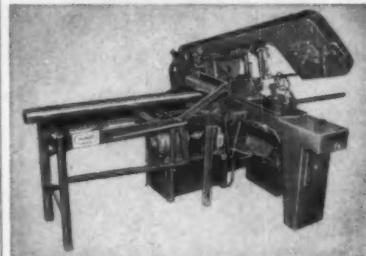
Other POWERCRAFT Products
• Indoor and Outdoor Type Disconnecting
Switches
• Bus Clamps • Power Connectors
• Pipe Frame Fittings for 1-1/4" I. P. S.
Pipe • Clamp Insulator Supports

• Our New catalog is yours for the asking

POWERCRAFT CORPORATION

2215 DeKalb St. St. Louis 4, Mo.
Phone P^{rospect} 6-4532 • Since 1932

KALAMATIC AUTOMATIC BAR FEED ATTACHMENT



Converts Kalamazoo Metal Cutting Band Saws to fully automatic cut-off machines

Feeds conduit, pipe, rounds, flats, hex, etc.—any length 3/16" to 12". Gives you the savings of full automatic cutting never before possible at such low cost.

GET DETAILS FROM YOUR
KALAMAZOO DEALER, TODAY.

*Additional feeding length to 30", at extra cost.

MACHINE TOOL DIVISION

Kalamazoo TANK &
SILO CO.

1040 Harrison Street, Kalamazoo, Michigan

**ELECTRIC
MOTOR
PARTS**

We'll give you quick delivery
and lowest prices

on parts for Brown & Brockmeyer •
Century • Delco • General Electric • Jack & Heintz
• Leland • Marathon • Packard • Redmond •
Sunlight • Wagner • Westinghouse—motors
Write for catalog—on your letterhead—to

The HARRY ALTER CO., Inc.

1728 S. Michigan Ave.
Chicago, Illinois

134 Lafayette St.
New York, N. Y.

WHOLESALE ONLY

HARRY ALTER gives you snappy service!

experience pays

let TWS* prepare
your industrial literature

*TECHNICAL WRITING SERVICE
McGraw-Hill Book Co.
330 W. 42nd St., N.Y.C.

send for information

Lighting Division in New York-
Newark area.

SOUTH ATLANTIC

G & W Electric Specialty Co.: J. L. Howarth, sales representative for Birmingham, Ala., area.

Luminous Ceilings, Inc.: D. A. Hills, southeastern representative and sales engineer.

EAST CENTRAL

General Electric Co., Carboloy Dept.: Michael D. Barnett, midwestern district sales representative.

Phelps Dodge Copper Products Corp.: Russell C. Bowen, central regional sales manager.

Federal Pacific Electric Co.; James J. Dugan, Detroit district manager.

Vulcan Stamping & Mfg. Co.: Donald R. Hoover, sales representative for Chicago area.

General Electric Co.: H. J. Wynn, Weathertron field representative for Indiana, Ohio, Kentucky, West Virginia, and western Pennsylvania with offices in Canton, Ohio; William A. Mulcock, air conditioning sales manager for North Central States from Indiana to Nebraska, offices in Chicago.

WEST CENTRAL

Line Material Co.: Earl Kirsch, field engineer for northeastern Kansas and northwestern Missouri with offices in Kansas City.

Graybar Electric Co.: C. A. Rettenmayer and F. P. Hoeffler, district operating managers for Minneapolis and St. Louis.

Chelsea Fan & Blower Co., Inc.: George C. Blew, sales representative for the Plain States. Offices in Kansas City, Mo.

Permacel Tape Corp.: Jack Richardson, manager of new southwestern division headquartered at Dallas, Texas.

WEST

Union Switch and Signal Division of Westinghouse Air Brake Co.: L. T. Lincoln, general apparatus sales engineer for West Coast.

Minneapolis-Honeywell Regulator Co.: George Maves, manager of Pacific regional sales office in Los Angeles.

Electro Dynamic Motor-Generator Div. of General Dynamics Corp.: Robert Hoffman, western regional manager.

Accurate Manufacturing Co.: M. J. Clary, northern California sales representative with offices in San Francisco.

Sylvania Electric Products Inc.: Robert C. Harper, manager of the western sales region of the lighting division.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT OPPORTUNITIES

UNDISPLAYED RATE

(Not available for equipment advertising)
\$1.20 a line, minimum 3 lines.
POSITIONS WANTED undisplayed advertising
rate is one-half of above rate, payable in
advance.

Box Numbers—Count as one line. Replies mailed
same day received.

Discount of 10% if full payment is made in
advance for 4 consecutive insertions.

DISPLAYED RATE

The advertising rate is \$11.00 per inch.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 550 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

WANTED, ELECTRICAL Sales Engineer. To travel Indiana, Ohio, Illinois, Southern Michigan. Make take-offs and handle bid follow-through on line of industrial and commercial electrical distribution equipment. Car, salary, bonus, expenses. Possible future sales management. Daily Equipment Co., 111 143rd St., Hammond, Ind.

WANTED

ANYTHING within reason that is wanted in the field served by Electrical Construction & Maintenance can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

NEED WIRE? Want Bargain Prices?

World's largest stock of nearly every conceivable type of electric and electronic wire & cable, all at surplus prices.

Let Us Know What You Need!

COLEMAN CABLE AND WIRE COMPANY
4513 West Addison St. Chicago 41, Ill.

FOR SALE

One semi-automatic Resistance Starter

AB #640, 75 HP, 220V, 188A, 3 phase, 60 cycles.
HOFFMAN LUMBER COMPANY
Fort Atkinson
Wisconsin

ELECTRICAL WIRE AND CABLE

Your Best Source

- for every industrial and power application
- Old lengths—long and short—reasonably priced
- LARGEST STOCK IN MIDWEST

Let us quote on requirements—

send your inquiries—

We'll also buy your surplus

Branch Offices—

Houston—

Los Angeles—

Chicago—

Atlanta—

St. Louis—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

Los Angeles—

Chicago—

Baltimore—

Philadelphia—

Seattle—

Portland—

San Francisco—

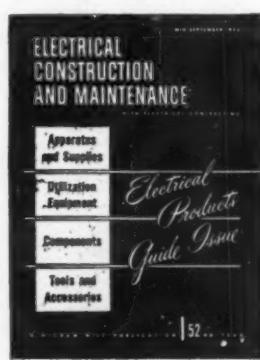
Los Angeles—

Chicago—

Baltimore—

Advertising In This Issue

Abolite Lighting Div. Jones Metal Products Co.	200	Hindle Transformer Co., Inc.	209	Royal Electric Co., Inc.	196
Adalec Mfg. Co.	206	Hubbell, Inc., Harvey	149	Ruby-Philite Corp.	182
• Adam Electric Co., Frank	17	• Ideal Industries, Inc.	173	• S&C Electric Co.	49
Allen-Bradley Co.	165, 166	• International Register Co.	124	Sangamo Electric Co.	30
• Allis-Chalmers Mfg. Co.	9, 37	I-T-E Circuit Breaker Co.	20, 21	Scherr Co., Inc., George	206
• All-Steel Equipment, Inc.	31	• Johns-Manville	44	• Signal Engineering & Mfg. Co.	202
Alpha Wire Corp.	162	Jones Metal Products Co., The	200	Silvay Lighting, Inc.	160
Alter Co., The Harry	208	Kalamazoo Tank & Silo Co.	208	• Simplex Wire & Cable Co.	19
Amplex Corp.	197	Kennecott Copper Corporation	140, 141	Smithcraft Lighting Division	181
Anaconda Wire & Cable Co.	64, 126, 127	Keystone Mfg. Co.	198	Sola Electric Co.	187
Appleton Electric Co.	2	Klein & Sons, Mathias	136	Spang-Chalfant (Div. of the National Supply Co.)	39
• Arro Expansion Bolt Co.	194	• Leviton Mfg. Co.	18	Square D Co.	51
Arrow-Hart & Hegeman Electric Co.		Litecontrol Corp.	32	Third Cover	
The	15, 100, 101	Luminous Ceilings, Inc.	178	• Standard Transformer Co.	202
• Art Metal Co., The	189	McGill Mfg. Co., Inc.	22	Steel & Tubes Division	54, 55
Baldor Electric Co.	128	McGraw-Hill Book Co.	209	Superior Electric Co., The	62
• Barth Corporation, The	150	Mend-It-Sleeve Mfg. Co.	209	Sylvania Electric Products, Inc.	8
Belden Manufacturing Co.	46	• Mineralac Electric Co.	206	• Thiel Tool & Eng. Co.	204
Benjamin Electric Mfg. Co.	137, 205	• Mitchell Mfg. Co.	176	Thomas & Betts Co., The	122, 123
Biddle Co., James G.	174	• Moloney Electric Co.	125	Thompson Electric Co., The	144, 145
Black & Decker Mfg. Co.	27	Nelson Electric Mfg. Co.	207	• Unistrut Products Company	109
Blackhawk Mfg. Co.	168	• Okonite Co., The	57, 134	• United States Rubber Co.	1, 42, 43
• Borthig Co., Inc., George C.	203	Onan & Sons, Inc., D. W.	108	Wadsworth Electric Mfg. Co. Inc.	200
Briegel Method Tool Co.	14	• Oster Mfg. Co., The	38	• Wagner Electric Corp.	16, 107
Broan Mfg. Co., Inc.	153	Pass & Seymour, Inc.	36	Wakefield Brass Co., F. W., The	147
Bryant Electric Co., The	26	• Phelps Dodge Copper Products Corp.	24, 25	Western Insulated Wire Co.	138
Buffalo Forge Co.	148	Pierce Renewable Fuses, Inc.	152	Westinghouse Electric Corp.	
• Bulldog Electric Products Co.	23	• Pittsburgh Reflector Co.	195	Pittsburgh	111, 112, 113, 114, 115
Burndy Engineering Co.	99	• Pittsburgh Standard Conduit Co.	60	116, 117, 118	
• Century Electric Co.	158	Porter-Cable Machine Co.	201	Weston Electrical Instrument Corp.	52
Certified Ballast Mfgs.	45	Powder Power Tool Corp.	171	• Wheeler Reflector Co.	179
Champion DeArment Tool Co.	167	• Powercraft Corp.	208	Where To Buy	209
Champion Lamp Works.	184	Pyle-National Co., The	129	Whitehead Stamping Co.	170
Clark Controller Co., The	106	Pyramid Instrument Corp.	195	Wincharger Corp.	28, 29
• Cope, Inc., T. J.	47	Quadrangle Mfg. Co.	192	Youngstown Sheet & Tube Co., The	10
Corning Glass Works.	175	Ramset Fasteners Inc.	190	• Zenith Electric Co.	204
Crescent Ins. Wire & Cable Co.	155	• Rawplugs Co., Inc., The	193		
• Crouse-Hinds Co.	12, 13	RCA Service Co., Inc.	198		
Curtis Lighting, Inc.	191	Remington Arms Co., Inc.	169		
Cutter-Hammer, Inc.	35	Republic Steel Corp.	54, 55		
Day-Brite Lighting, Inc.	156, 157	Revere Electric Mfg. Co.	207		
Diehl Manufacturing Co.	53	Ridge Tool Co., The	161		
Dossert Mfg. Corp.	142	RLM Standards Institute, Inc.	143		
DuPont De Nemours & Co., Inc., E. I.	185	Robot Appliances, Inc.	209		
Edwards Co.	50	Roebling's Sons Corp., John A.	102		
Efficiency Elec. & Mfg. Co.	205	Roller-Smith Corp.	41		
Electrical Construction and Maintenance	56	Rome Cable Corp.	58, 59		
Electrical Facilities Inc.	172				
Electric Storage Battery Co., The	105				
• Electro Compound Co.	180				
• Electro-Silv-A-King Corp.	40				
Electromode Corporation	139				
Erico Products, Inc.	163				
Fairbanks Morse & Co.	5				
• Federal Pacific Electric Co.	11, 120				
Fullman Mfg. Co.	104				
Furnas Electric Co.	204				
• G&W Electric Specialty Co.	146				
• Garden City Plating & Mfg. Co.	186				
• General Electric Co.					
• Apparatus Sales Div.	Second Cover				
	33, 34				
• Construction Materials Div.	Fourth Cover				
	130				
Distribution Assemblies Dept.	6, 7				
Lamp Division	48				
• Graybar Electric Co., Inc.	66				
Greenlee Tool Co.	188				
• Guth Co., The Edwin F.	151				
Haynes Products Co.	209				
Hazard Insulated Wire Works	57, 134				
• Helwig Co.	180				



• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

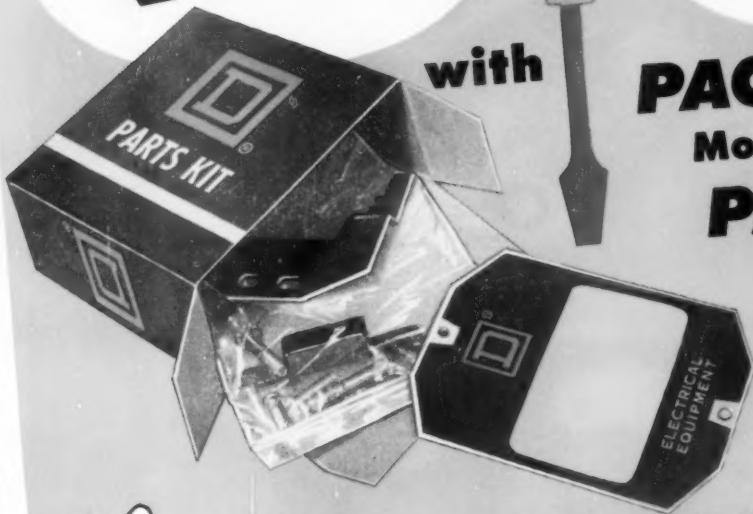
For more complete information, and application data on their lines, refer to the Index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.

Qwik

Change

with

PACKAGED
Motor Starter
PARTS!



New PUSH BUTTON KIT

OTHER
KITS...

Selector Switches
Interlocks
Replacement Parts
Contacts
Coils
Overload Relays



EASY to Identify!

Easy-to-read catalogs, simplified motor control and overload relay selectors, illustrated service bulletins...these all combine to assure quick changes through easy parts identification.

EASY to Buy!

Conveniently packaged and labeled conversion parts are immediately available "off-the-shelf" from nationwide network of authorized Square D electrical distributors.

FASTER to Install!

Conveniently packaged parts can be installed using only a screw driver and without disturbing any wiring.

Write for Bulletin 9999. Address Square D Company,
4041 North Richards Street, Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY



**Here's the best way to prove that
NEW G-E WHITE IS EASIER TO BEND**

Every time you bend or thread new G-E white conduit, you'll prove to yourself that metallizing makes your job easier. Metallizing is a completely different galvanizing process that permanently bonds a uniform coating of pure zinc to the entire exterior of the conduit, even the threads. The excessive heat, quenching, and straightening used in other galvanizing processes are eliminated with metallizing. The result is a more ductile conduit that is easier to handle.

EASIER THREADING. Metallizing produces a unique zinc structure that acts as a lubricant for cutting tools. Threads are easier to cut right on the job.

EASIER FISHING AND WIRE PULLING. New G-E White has a tough, corrosion-resistant, organic coating tightly bonded

to the inside of the conduit. This coating contains an anti-friction agent that permits conductors to slide through the conduit easily, thus cutting fishing and wire-pulling time and effort.

BETTER CORROSION RESISTANCE. Metallizing, covered by a tough coating of C-553 lacquer, produces a conduit that has been proved exceptionally resistant to smoke, heat, humidity, acid fumes, alkalies, and salt atmospheres.

New G-E white conforms to all Federal Specifications, American Standards Association Specifications, and is listed by Underwriters' Laboratories, Inc. Ask your distributor for more information or write Section C48A-1018, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

GENERAL ELECTRIC



WITH GENERAL ELECTRIC WIRING SYSTEMS